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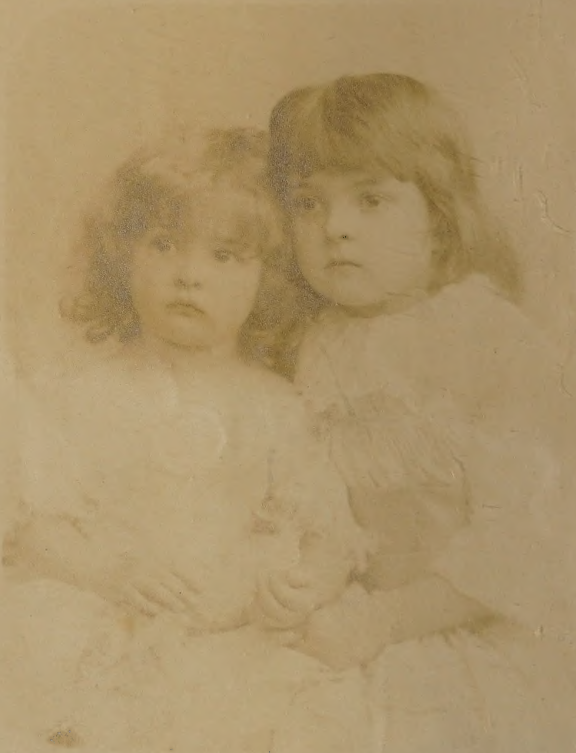

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THE BRITISH JOURNAL

PHOTOGRAPHIC ALMANAC

AND

Photographer's Daily Companion

FOR

1887.

EDITED BY J. TRAILL TAYLOR.

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PREFACE.

THE Preface of an Annual like the present one being necessarily written after all the matter is in type affords a means of speaking of its contents.

Believing as I do that, although at present somewhat dormant, the art of Stereoscopic Photography has yet a great future before it and is destined to come prominently to the front, I have thought it well to devote a few chapters to some of its phases, in the hope of stimulating practice in Binocular Photography.

The Formulæ are brought up to date.

A few pages of useful Receipts of a class calculated to be appreciated by photographers will be found embodied.

To the numerous friends who have, whether spontaneously or by request, aided me by their invaluable contributions in keeping up the character of this work I tender my best thanks. And this includes those whose contributions have been received too late for insertion; for, in accordance with announcements publicly made, we have gone to press at an earlier date than in former years, this having been demanded by the exigencies of a largely increased foreign circulation.

The illustration this year is on Alpha paper supplied by the Britannia Works Company.

J. TRAILL TAYLOR,
Editor.

2 York Street, Covent Garden, W.C.,
December 1, 1886.

CONTENTS.

TITLE.	BY	PAGE
Adherence of Films	C. Piazzi Smith, Astronomer Royal for Scotland	75
'Advocatus pro Diabolo'	Marston Moore	153
Alternating Stereoscope	...	278
Alum and Acid *versus* Yellow Negatives	G. Watmough Webster, F.C.S.	88
Automatic Apparatus for Making Saturated Solutions, An	C. Beckett Lloyd	201
Blisters	T. Kane (Brooklyn, N.Y.)	106
Blocking Out Skies and Non-essential Objects	Thomas Scotton	239
Brass Work of Lenses, To Blacken	...	292
Bromide Printing, Hints on	Jas. C. Leake	241
Button for Common Printing Frame	Zachary H. Kingdon	143
Cabinet for Sensitive Paper	...	289
Camera, Detective	...	290
——— McKellen's Improved	...	283
Canvases for Enlargement, On the Preparation of	H. Holman	185
Carelessness of Plate and Film Makers	Butler Colman	186
Celestial Photography	S. J. Perry, F.R.S.	122
Centrifugal Separator	...	283
Changing Plates when Travelling	Russell Sedgfield	112
Cheap, Simple, and Effective Reducer for Gelatine Negatives	H. Hall	144
Chloride of Gold: A Simple Method to Make	Thomas Forrest	184
Clouds in Negatives and Prints	George Davison	2·6
——— Toning, &c.	Thomas Earp	115
Collodion Dry Plates, An Incident in Connexion with	Marcus H. Rogers (East Brimfield, U.S.A.)	116
——— Emulsion Notes	W. B. Bolton	71
Combined Light Screen and Developing Dish Holder, A	Richard Crowe	199
Common Things	Thomas Samuels	192
Correct Exposure, The Area System of Marking Lenses and Diaphragms for Photographic Purposes to Ensure	George Smith	126
Crows, On	Richard Keene	157
Dangers, Avoidable	A. L. Henderson	172
Dark Slide Lock	...	288
——— Vergara's	...	282
Developer, Another	A. E. Bannister	169
——— Bœlte's	...	272
——— for Gelatino-Bromide Dry Plates, A Good	Clement J. Leaper	180
——— New York Standard	...	275
——— The Alkaline	William Brooks	138
Developers, Dissected	Thomas Forrest	186
Developing, Intensifying, and Reducing.—Stripping Films, and other Matters	G. H. E. Sutton	146
Developing Lamp, A Modified	C. H. Bothamley, F.C.S.	180
——— Room Illumination	W. H. Harrison	155
——— Solutions, Preventing the Deterioration of	T. H. Norris	264
Development, Aids to	John Jackson	152

CONTENTS—*(continued)*.

TITLE.	BY	PAGE
Development and Toning, Reliable	Chas. J. Hall	144
——— A Testimony in Favour of Soda for	William Hanson	137
——— in Hot Climates	Col. Stuart Wortley	215
——— Minor Matters in	Andrew Pringle	84
Distorted Portraits Caused by Expansion of Paper	W. H. Prestwich	205
Dovedale, A Day with the Camera in	R. Railston Brown, C.E.	120
Drying Gelatine Negatives Quickly		293
Dry Plates, Non-exposed	Thomas Gulliver	167
Dry Plate Packing for Travelling	George Bankart	112
Electric Lamp for Dark Room		278
Engravings, To Bleach		292
Enlargements from Small Negatives: Further Experience	G. A. Kenyon, M.B.	173
——— on Bromide Paper	J. Vincent Elsden, B.Sc.	129
Enlarging Apparatus		276
——— Home-made	Harold Power	188
——— or Reducing	G. M. Iliff	206
——— &c., Remarks on	Dr. Valentine Knaggs	221
Eosine, Experiments with	J. Werge	104
Epitome of Progress during 1886	Editor	245
Erythrosin		275
Evenings, Portraiture in the	Colonel Draper	244
Exhibitions' Damp Walls and How to Render them Harmless to Photographs	Thomas G. Whaite	187
Experiment, A Field for	Alexander Mackie	162
——— and an Experience, An	R. L. Maddox, M.D., Hon. F.R.M.S.	77
Ferrous Sulphate	A. Treyer Evans	226
Field Clubs, Suggestions for the Formation of Photographic	J. C. Stenning	118
Focus, Range of		274
Focussing Cloth, Substitute for		209
Frilling, Potash a Cause of	H. W. Gridley (New York)	200
Gas-burner for Dark Room		290
Gasometer, A Portable High-pressure	Albert W. Scott	131
Gathering of 1887, The	Mark Oute	130
Gelatino-Bromide Paper Workers, Hints to	E. W. Foxlee	91
——— Chloride Emulsion	H. J. Palmer	272
——— Chloride Printing-out Paper	J. Barker	185
General Hints from well-tried Experiences	W. Harding Warner	110
Glass Trays, Substitute for	Prof. E. Stebbing (Paris)	142
Gold in Silver Prints in Relation to their Permanency	W. K. Burton	92
Half Tones	J. Hubert	155
How an Order was Quickly Executed	E. G. Rivers	229
——— the Restraining Action of Bromide was Discovered	Major Russell	240
——— to Wash Prints: A Wrinkle for Amateurs	H. W. Hollis, F.R.A.S.	102
Incidents, Two	H. Norwood Atkins	175
Is Retouching Legitimate or Not?	A. G. Field	117
Italy, Photography in	Albert Levy (Paris)	234
Knowing some of the Properties of a Dry Plate at Sight, On	A. Pumphrey	131
Lantern Slides, Respecting the Marking of	Edwin Cocking	231
——— Stand for		284
——— Transparencies without a Camera	J. Hay Taylor (Florida)	233
Lighting, Artificial	George Mason	97
——— Suggestions on	T. Protheroe	139
Limelight Apparatus, Improvement in	A. Pumphrey	126
Machine for Coating Plates		277
Media, Non-actinic	James Alexander Forrest	158
Method of Estimating the Value of Photographic Waste, A	Nemo	235
Microscopic Attachment for Lantern		278
Mounting without Cockling	J. J. Acworth, F.I.C., F.C.S	206

CONTENTS—(*continued*).

TITLE.	BY	PAGE
Names for Pictures	William Adcock	111
Naturalism and Photography	H. P. Robinson	80
Negatives, How to Ensure Clean, Bright	S. R. Bottone	138
——— Paper	S. D. McKellen	207
——— Silver Intensification of	John Birtles	233
——— Translucent Paper	Rev. H. B. Hare	143
New Method of Rendering Paper Negatives Translucent, A	P. Swanson	176
On Tour	Rev. J. Carter Browne, D.D.	167
Orthochromatic Photography Simplified	Robert S. Buchanan	229
Oxygen, Portable Apparatus for Generating		283
——— Regulator		281
Oxyether Light	G. R. Baker	122
Oxyhydrogen Jet		281
Panoramas, Hints on Taking	F. York	134
Panoramic Background Frame, Whaite's	T. G. Whaite	170
Paper Negatives, A Plea for	John A. Hodges	242
Pedestal Portraits, Another Plan of Producing	W. M. Ashman	100
Pharyngitis and Photography	P. H. Emerson, B.A., M.B. (Cantab.)	107
Photographic Exhibition of 1886 from a Retoucher's Point of View, The	Redmond Barrett	124
Photographer's Library, A	W. Jerome Harrison, F.G.S.	90
Photographs and other Prints, How to Clean	Hermann Schnauss	179
Photo-lithography, Negatives for	Dr. Ed. Liesegang	108
Photo-micrography	Procella	177
——— with a Microscope or a Camera	T. Charters White, M.R.C.S.	149
Plate Boxes, Emptied	C. Oakeshott	129
—— Carriers, Improved	Ernest Graham	87
Plates: Commercial and Home-made	Rev. B. Holland	108
Porcelain Bath, Grooved		286
Potash Developer, The	F. C. Beach (New York)	82
Printing by Development	S. Herbert Fry	123
——— Process, New		271
——— Process of the Future, The	Herbert S. Starnes	165
——— Processes, Hints on	A. R. Dresser	163
Print Mounting, Artistic	John W. Leigh	105
—— washing Machine, A	W. England	214
Prints, Carbon Solar	William H. Sherman	133
Process of the Past, A	Geo. Dawson, M.A., Ph.D.	230
Progress in Photography	George Smith	111
Proofs, Reducing Over-printed	W. E. Debenham	219
Pyro and Potash Developer, Another	W. I. Lincoln Adams	188
—— for Silver Intensification	H. Y. E. Cotesworth	190
Pyrogallic Acid in Solution, Preserving	J. T. Hackett	101
Quick Lenses and Ordinary Plates, or *Vice Versâ*	Thomas Gulliver	170
—— Way of Fixing the Camera to Tripod Head, A	W. Horton	195
Reproduction.—Photography in Hot Climates	C. Heinrich Trinks	191
Residues	C. H. Bothamley, F.C.S.	117
Retouching Desks	W. H. Hutton	159
Rocking Machine, and the Development of Gelatine Plates, A	F. P. Leon	195
——— Table, A		289
Roller Slide, Morgan & Kidd's		288
Scientific Development	William Bishop	140
Seat of War, Photography at the	Melton Prior	237
Sensitised Film, The Action of Light upon a	J. Barker	182
——— Paper, Some Notes on Ready	Arthur H. Elliott, Ph.D.	183
Shutter, A New	J. A. Harrison	225
——— Diaphragmatic		280
——— Forrest's		286
——— Reynolds and Branson's		285
Shutters, Instantaneous	Assam	208
——— Quick-acting	Richard Parr	204
Silver, The Last Print in	Edgar Clifton	137

CONTENTS—(*continued*).

TITLE.	BY	PAGE
Sodium Hyposulphite and the Ferrous-oxalate Developer	A. Treyer Evans	202
Stains, To Remove Oil	...	292
Stereoscopic Photography	Editor	53
——— Work	Francis Cobb	128
Stoppers, Removing Fixed	...	291
Stray Thoughts	Friese Greene	171
Stripping Films	H. Manfield	160
Sulphite of Soda for Fixing Prints	Captain W. de W. Abney, R.E., F.R.S.	80
Sulphocyanide Toning	...	273
Sulphur and Light	Robert Offord	189
Summary	Editor	51
System or No System	A. Cowan	215
Things in General, On	Assam	218
Toning	Edward Dunmore	109
——— On the Importance of a Liberal Supply of Gold in	Valentine Blanchard	220
——— Transparencies, Preparation of Bichloride of Platinum for	S. W. Rouch	240
Transparencies, Window	C. C. Vevers	125
——— Window and Lamp	W. Irving Adams (New York)	241
Trials of an Amateur Photographer's Wife, The	A. F. L.	95
Tripods	Ellerslie Wallace	87
Two 'Dodges'	J. W. Lapham	143
Trivialities in Practice, Some	J. A. C. Branfill	115
Varnish Bottle, A	C. H. Bothamley, F.C.S.	114
Washing Gelatine Emulsion	Chas. A. Parker	228
Westminster Abbey	G. T. Grammer	99
Willesden Paper for Photographic Use	Baynham Jones	158

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THE MAGNIFICENT PICTURES to which the Jury awarded Medals at the above Exhibition by Messrs. Annan and Swan, The Autotype Company (Negative by P. H. Emerson, M.A., M.B.), L. Blake, W. Cobb, F. Eilender, H. W. Gridley, R. H. Lord, F. M. Sutcliffe, G. B. Wood, and others, were taken with

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JANUARY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H.	M.	Sets. H.	M.	MOON. Rises. Morn.	Sets. After.
1	S	[*Photographisches Archiv* f. 1860	8	9	3	59	11 34	11 35
2	**S**	2nd S. after Christmas. ☽ 0.21 A.	8	9	4	0	11 56	Morn
3	M	Prof. J. W. Draper d. 1882	8	8	4	1	After	0 39
4	Tu		8	8	4	2	0 42	1 44
5	W		8	8	4	3	1 10	2 50
6	Th		8	8	4	5	1 40	3 57
7	F	Daguerreotype com. to A. of Sc. 1839	8	7	4	6	2 22	5 4
8	S		8	7	4	7	3 11	6 10
9	**S**	1st Sunday after Epiphany	8	6	4	8	4 10	7 11
10	M	[○ 10.32 A.	8	6	4	10	5 18	8 4
11	Tu		8	5	4	11	6 33	8 49
12	W		8	4	4	13	7 53	9 27
13	Th		8	4	4	14	9 12	10 0
14	F	*Liverpool Photo. Journal* f. 1854	8	3	4	16	10 29	10 29
15	S	G. W. Simpson d. 1880	8	2	4	17	11 47	10 57
16	**S**	2nd Sunday after Epiphany	8	1	4	19	Morn	11 24
17	M	[☾ 3.22 A.	8	0	4	20	1 2	11 52
18	Tu	E. Lacan d. 1879. Reglander d. 1875	7	59	4	22	2 15	After
19	W	Regnault d 1878	7	58	4	24	3 26	0 56
20	Th	Photo. Society of London f. 1853	7	57	4	25	4 32	1 36
21	F	Fox Talbot b. 1800	7	56	4	27	5 32	2 21
22	S	[Newton d. 1869. Mr. Burgess d. 1873	7	55	4	29	6 26	3 13
23	**S**	3rd Sunday after Epiphany. Sir W.	7	54	4	30	7 12	4 10
24	M	● 3.1 M.	7	53	4	32	7 51	5 11
25	Tu		7	51	4	34	8 24	6 13
26	W		7	50	4	36	8 53	7 16
27	Th		7	49	4	37	9 17	8 20
28	F	Photo-sculpture pat. by Willème, '63	7	47	4	39	9 39	9 23
29	S	Pouncy's fatty-ink process pat. 1863	7	46	4	41	10 0	10 26
30	**S**	4th Sunday after Epiphany. Fox	7	45	4	43	10 22	11 29
31	M	[Talbot's first c. to Roy. Soc. 1839	7	43	4	44	10 45	Morn

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JANUARY.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	S		
2	S	2nd Sunday after Christmas	
3	M	Notts, Blackburn	
4	Tu	Bolton C., Sheff., Sutton, Paisley, N. Lon.,	
5	W	Ed.S.,N.Staff. [Hlmfth.,Glos.D.,Cov.,Car.	
6	Th	Bolton Soc., Dun., Glas. A., Leeds, S. Lon.	
7	F	Derby, Halifax Society	
8	S		
9	S	1st Sunday after Epiphany	
10	M		
11	Tu	Gt. Britain, Newcastle, Manchester Ama.	
12	W		
13	Th	Birknhd., Bradford, Cheltenham, Halifax,	
14	F	Yorks. Coll., Ireland [Manchester Soc.	
15	S		
16	S	2nd Sunday after Epiphany	
17	M	Notts	
18	Tu	Glasgow Amateur, North London	
19	W	Bury, Edinburgh Club, Hyde, Manchester	
20	Th	[Club, Bristol	
21	F		
22	S		
23	S	3rd Sunday after Epiphany	
24	M		
25	Tu	Great Britain (Technical)	
26	W	Burnley	
27	Th	Burton, Liverpool Amateur, Oldham, Hull	
28	F		
29	S		
30	S	4th Sunday after Epiphany	
31	M		

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D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. Morn.
1	Tu	☽ 8.27 M.	7 41	4 47	11 10	0 33
2	W		7 39	4 49	11 40	1 38
3	Th		7 38	4 51	After	2 44
4	F		7 36	4 53	0 58	3 49
5	S	W. D. Sanderson d. 1885	7 34	4 54	1 50	4 52
6	S	Septuagesima Sunday	7 33	4 56	2 53	5 48
7	M		7 31	4 58	4 5	6 38
8	Tu	Calotype Process pat. 1841 ○ 10.14 M.	7 29	5 0	5 24	7 21
9	W		7 27	5 2	6 45	7 57
10	Th	Sir David Brewster d. 1868	7 26	5 4	8 8	8 29
11	F		7 24	5 6	9 28	8 58
12	S		7 22	5 7	10 47	9 27
13	S	Sexagesima Sunday. Leon Fon-	7 20	5 9	Morn	9 54
14	M	St. Valentine [cault d. 1868	7 18	5 11	0 4	10 25
15	Tu	Oliver Sarony b. 1820 ☾ 1.32 M.	7 16	5 13	1 17	10 59
16	W	Glasgow Photo. Society f. 1860	7 14	5 15	2 25	11 36
17	Th	[portraiture) pat. 1857	7 12	5 17	3 27	After
18	F	Moule's Photogen (artificial light for	7 10	5 18	4 23	1 10
19	S	[of Helioplastie pub. 1855	7 8	5 20	5 11	2 4
20	S	Quinquagesima S. Poitevin's p.	7 6	5 22	5 51	3 3
21	M	Bingham d. 1870	7 4	5 24	6 25	4 4
22	Tu	● 9.40 A.	7 2	5 26	6 55	5 7
23	W		7 0	5 27	7 20	6 10
24	Th		6 58	5 29	7 43	7 13
25	F	[Padre Secchi d. 1876	6 56	5 31	8 5	8 16
26	S	Arago b. 1786. Senefelder d. 1834.	6 54	5 33	8 28	9 19
27	S	1st Sunday in Lent	6 52	5 34	8 50	10 23
28	M		6 49	5 36	9 14	11 27

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1	Tu	Bol. C., Shef., Sut., Pais., N. Lon., Hlmfth.,	
2	W	Edin. Soc., N. Staff. [Gl. Da., Cov., Car.	
3	Th	Bolton S., Dund., Glas. A., Leeds, S. Lon.	
4	F	Derby, Yorkshire College, Halifax Society	
5	S		
6	S	Septuagesima Sunday	
7	M	Notts, Blackburn	
8	Tu	Great Britain, Newcastle, M'chester Ama.	
9	W		
10	Th	Birkenhd., Bradfd., Cheltenham, Halifax,	
11	F	Ireland [Manchester Society	
12	S		
13	S	Sexagesima Sunday	
14	M		
15	Tu	Glasgow Amateur, North London	
16	W	Bristol, Bury, Edin. C., Hyde, Manch. C.	
17	Th		
18	F		
19	S		
20	S	Quinquagesima Sunday	
21	M	Notts	
22	Tu	Great Britain (Technical)	
23	W	Burnley	
24	Th	Burton, Liverpool Ama., Oldham, Hull	
25	F		
26	S		
27	S	1st Sunday in Lent	
28	M		

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MARCH.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	Sets. H. M.	MOON. Rises. Morn.	Sets. Morn.
1	Tu		6 48	5 37	9 40	Morn
2	W		6 46	5 39	10 12	0 31
3	Th	☽ 1.8 M.	6 44	5 41	10 51	1 34
4	F	Poitevin d. 1882	6 42	5 42	11 37	2 36
5	S	La Place d. 1827. J. Albert b. 1825	6 40	5 44	After	3 34
6	S	2nd S. in Lent. Fraunhofer b. 1787	6 37	5 46	1 38	4 26
7	M	J. N. Niepce b. 1765. Herschel b.	6 35	5 48	2 52	5 11
8	Tu	[1792	6 33	5 49	4 12	5 50
9	W	○ 8.34 A.	6 31	5 51	5 35	6 25
10	Th		6 28	5 53	6 59	6 55
11	F	St. Claire Deville b. 1818	6 26	5 55	8 21	7 24
12	S		6 24	5 56	9 42	7 54
13	S	3rd Sunday in Lent	6 22	5 58	11 0	8 24
14	M	Herschel int. hypo for fixing, 1839	6 19	6 0	Morn	8 57
15	Tu	F. A. Wenderoth d. 1884	6 17	6 2	0 13	9 34
16	W	☾ 1.42 A.	6 15	6 3	1 20	10 17
17	Th		6 13	6 5	2 19	11 5
18	F		6 10	6 7	3 9	11 58
19	S	Thos. Sutton d. 1875	6 8	6 8	3 52	After
20	S	4th Sunday in Lent	6 6	6 10	4 28	1 57
21	M	Bingham d. 1870	6 4	6 12	4 59	2 59
22	Tu		6 1	6 13	5 25	4 2
23	W		5 59	6 15	5 49	5 4
24	Th	Becquerel b. 1820 ● 4.10 A.	5 57	6 17	6 11	6 7
25	F	Hermagis d. 1868	5 54	6 18	6 32	7 11
26	S		5 52	6 20	6 54	8 15
27	S	5th Sunday in Lent	5 50	6 22	7 17	9 19
28	M	La Place b. 1749	5 47	6 23	7 43	10 23
29	Tu		5 45	6 25	8 13	11 26
30	W	Balard d. 1876	5 43	6 27	8 49	Morn
31	Th	Bunsen b. 1811	5 41	6 28	9 31	0 27

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MARCH.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	Tu	Carl., Glos. Dale, Hlmfth., N. Lond., Sutton,	
2	W	Edin. Soc., N. Staff. [Paisley, Sheffield	
3	Th	Bolton Soc., Dund., Glas. A., Leeds, S. Lond.	
4	F	Halifax Society, Yorkshire College	
5	S		
6	**S**	2nd Sunday in Lent	
7	M	Notts, Blackburn	
8	Tu	Gt. Britain, Newcastle, Manchester Am.	
9	W		
10	Th	B'head, Bradford, Cheltenham, Halifax C.,	
11	F	Ireland [Manchester Soc.	
12	S		
13	**S**	3rd Sunday in Lent	
14	M		
15	Tu	Glasgow Amateur, North London	
16	W	Bristol, Bury, Hyde, Manch. C., Edin. C.	
17	Th		
18	F		
19	S		
20	**S**	4th Sunday in Lent	
21	M	Notts, Blackburn	
22	Tu	Great Britain (Technical)	
23	W		
24	Th	Burton-on-Trent	
25	F		
26	S		
27	**S**	5th Sunday in Lent	
28	M		
29	Tu		
30	W	Burnley	
31	Th	Liverpool Amateur, Oldham, Hull	

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APRIL.

D. M.	D. W.	Remarkable Events.	SUN.		MOON.	
			Rises. H. M.	Sets. H. M.	Rises. Morn.	Sets. Morn.
1	F	☽ 1.53 A.	5 38	6 30	10 21	1 25
2	S	First Sun Photo. by Tizeau & Foucalt,	5 36	6 32	11 20	2 18
3	S	Palm Sunday. ['45. Morse d. '72.	5 34	6 33	After	3 4
4	M		5 32	6 35	1 43	3 45
5	Tu	Rev. J. B. Reade b. '01. Isidore Niepce	5 29	6 37	3 2	4 20
6	W	[b. 1795	5 27	6 38	4 25	4 51
7	Th	Voightlander d. '78. Nièpce de St.	5 25	6 40	5 49	5 20
8	F	[Victor d. 1870. ○ 5.39 M.	5 23	6 41	7 11	5 49
9	S	Fox Talbot's First Art. in *Athenæum*	5 20	6 43	8 33	6 19
10	S	Easter Sunday. Pouncy's Carbon	5 18	6 45	9 52	6 51
11	M	Nottage d. '85 [Process pat. '58	5 16	6 46	11 4	7 27
12	Tu	T. R. Williams d. 1871	5 14	6 48	Morn	8 9
13	W		5 12	6 50	0 9	8 56
14	Th		5 9	6 52	1 5	9 49
15	F	☾ 4.4 M.	5 7	6 53	1 51	10 47
16	S		5 5	6 55	2 30	11 48
17	S	Low Sunday. Fargier's Carbon	5 3	6 57	3 3	After
18	M	[Process pat. 1861	5 1	6 58	3 30	1 53
19	Tu	Abbé Moigno b. 1804	4 59	7 0	3 54	2 56
20	W	J. A. Spencer d. 1878	4 57	7 2	4 17	3 59
21	Th	Talbot's Photo.-etch. Process pat. '58	4 54	7 3	4 37	5 2
22	F	Rev. F. F. Statham d. 1884	4 52	7 5	4 59	6 6
23	S	● 8.53 M.	4 50	7 6	5 22	7 10
24	S	2nd S. af. Easter. Celsius d. 1744	4 48	7 8	5 47	8 15
25	M	'Sun-blinds' pat. 1862	4 46	7 10	6 15	9 20
26	Tu	Adam Salomon d. 1881	4 44	7 11	6 49	10 23
27	W	Morse b. 1791	4 42	7 13	7 28	11 22
28	Th	Böttger b. 1806	4 40	7 15	8 15	Morn
29	F	Dixon's Iodide Emulsion Process pat.	4 38	7 16	9 11	0 16
30	S	[1861. Böttger d. 1881. ☽ 11.0 A.	4 36	7 18	10 15	1 3

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APRIL.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	F	Derby, Halifax Society	
2	S		
3	S	Palm Sunday	
4	M	Notts, Blackburn	
5	Tu	N.Lond., Glossop Dale, Holmfirth, Sutton,	
6	W	Edin. Soc., N. Staff. [Paisley, Sheffield	
7	Th	Bolton S., Dundee, Glas. A., Leeds, S.Lond.	
8	F	Yorkshire College, Ireland	
9	S		
10	S	Easter Sunday	
11	M		
12	Tu	Gt. Britain, Newcastle, Manchester Am.	
13	W		
14	Th	B'head, Bradford, Cheltenham, Halifax C.,	
15	F	[Manchester Soc.	
16	S		
17	S	Low Sunday	
18	M		
19	Tu	Glasgow Amateur, North London	
20	W	Bristol, Bury, Hyde, Manchester Club,	
21	Th	[Edinburgh Club	
22	F		
23	S		
24	S	2nd Sunday after Easter	
25	M	Notts, Blackburn	
26	Tu	Great Britain (Technical)	
27	W	Burnley	
28	Th	Liverpool Amateur, Oldham, Hull	
29	F		
30	S		

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MAY.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. Morn.
1	S	3rd Sunday after Easter	4 35	7 20	11 26	1 44
2	M		4 33	7 21	After	2 20
3	Tu		4 31	7 23	2 0	2 51
4	W	Senebier b. 1742	4 29	7 24	3 20	3 20
5	Th	J. W. Draper b. 1811	4 27	7 26	4 41	3 47
6	F	Humboldt d. 1859	4 25	7 28	6 3	4 15
7	S	Fortier d. 1882 ○ 2.1 A.	4 24	7 29	7 23	4 45
8	S	4th S. af. Easter. Peroxide of H. rec.	4 22	7 31	8 40	5 19
9	M	Guy Lussac d. '50 [for rem. of Hypo, '66	4 20	7 32	9 51	5 58
10	Tu	South London Photo. Soc. f. 1859	4 18	7 34	10 54	6 43
11	W	H. Baden Pritchard d. 1884	4 17	7 36	11 46	7 35
12	Th	Sir John Herschel d. 1871	4 15	7 37	Morn	8 33
13	F	Justus von Liebig b. 1803	4 14	7 39	0 29	9 34
14	S	Fahrenheit b. 1686 (8.17 A.	4 12	7 40	1 5	10 37
15	S	Rogation Sunday	4 11	7 42	1 34	11 41
16	M	C. Breese d. 1875	4 9	7 43	2 0	After
17	Tu	Belgian Photo. Association f. 1874	4 8	7 45	2 22	1 48
18	W		4 6	7 46	2 44	2 51
19	Th		4 5	7 47	3 5	3 54
20	F		4 4	7 49	3 27	4 58
21	S	Scheele d. 1786	4 2	7 50	3 50	6 4
22	S	Sunday after Ascension ● 11.5 A.	4 1	7 52	4 17	7 10
23	M	J. W. Gough d. 1878	4 0	7 53	4 49	8 15
24	Tu		3 59	7 54	5 26	9 17
25	W	T. J. Pearsall d. 1883	3 58	7 56	6 11	10 14
26	Th		3 56	7 57	7 5	11 4
27	F		3 55	7 58	8 7	11 47
28	S	[d. 1829	3 54	7 59	9 16	Morn
29	S	W. Sun. Pentecost. Sir H. Davy	3 53	8 1	10 29	0 24
30	M	J. Sidebotham d. 1885) 5.20 M.	3 52	8 2	11 45	2 56
31	Tu		3 52	8 3	After	1 24

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MAY.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	S	3rd Sunday after Easter	
2	M	Notts, Blackburn	
3	Tu	N.Lond., Glos.D., Holmfirth, Sutton, Shef.	
4	W	Edinburgh Society, North Staffordshire	
5	Th	Bolton Soc., Dundee, Leeds, South London	
6	F	Yorkshire College	
7	S		
8	S	4th Sunday after Easter	
9	M		
10	Tu	Gt. Britain, Newcastle, Manchester Am.	
11	W		
12	Th	B'head, Bradford, Cheltenham, Halifax C.,	
13	F	Ireland [Manchester Society	
14	S		
15	S	Rogation Sunday	
16	M		
17	Tu	North London, Glasgow Amateur	
18	W	Bristol, Bury, Hyde, Manch. C., Edin. C.	
19	Th		
20	F		
21	S		
22	S	Sunday after Ascension	
23	M	Notts, Blackburn	
24	Tu	Gt. Britain (Technical)	
25	W	Burnley	
26	Th	Liverpool Amateur, Oldham	
27	F		
28	S		
29	S	Whit Sunday.—Pentecost	
30	M		
31	Tu		

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JUNE.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.		SUN. Sets. H. M.		MOON. Rises. After.		MOON. Sets. Morn.	
1	W	Imp. in Calotype pat.	3	51	8	4	2	20	1	50
2	Th	Niepce pubsh. his *Heliochromic Pro-*	3	50	8	5	3	41	2	16
3	F	[*cesses*, 1851	3	49	8	6	5	0	2	44
4	S	Tessié du Mothay d. 1880	3	49	8	7	6	17	3	15
5	S	Trinity Sunday ○ 10.38 A.	3	48	8	8	7	30	3	51
6	M	Fordos d. 1878	3	47	8	9	8	38	4	32
7	Tu	Fraunhofer d. 1826	3	47	8	10	9	36	5	20
8	W		3	46	8	11	10	24	6	16
9	Th	Constant Delessert d. 1876	3	46	8	12	11	4	7	17
10	F	Talbot's Calotype Process pub. 1841	3	45	8	13	11	36	8	21
11	S	Cutting's American Bromide pat. '53	3	45	8	13	Morn		9	26
12	S	1st Sunday after Trinity	3	45	8	14	0	3	10	30
13	M	☾ 1.35 A.	3	45	8	15	0	27	11	34
14	Tu	Partnership between Daguerre and	3	44	8	15	0	49	After	
15	W	[Niepce, 1837	3	44	8	16	1	10	1	42
16	Th	Chrysotype and Cyanotype Processes	3	44	8	16	1	32	2	46
17	F	[com. to Roy. Soc.	3	44	8	17	1	54	3	50
18	S	O. G. Rejlander d. 1875	3	44	8	17	2	19	4	55
19	S	2nd S. af. Trin. Abbe Laborde d. '83	3	44	8	18	2	49	6	1
20	M		3	44	8	18	3	23	7	6
21	Tu	Niepce Memorial uncovered ● 10.53 M.	3	44	8	18	4	5	8	6
22	W	[at Chalons, 1885. Dr. Diamond d.	3	45	8	19	4	56	9	1
23	Th	Toovey's Photo.-litho. and Photo.-	3	45	8	19	5	56	9	48
24	F	[zinc and Eng. Pro. pat. '63	3	45	8	19	7	4	10	27
25	S	[Liesegang b. 1839	3	45	8	19	8	17	11	1
26	S	3rd S. af. Trin. W. B. Woodbury b. '34.	3	46	8	19	9	33	11	30
27	M	Herr Wothly d. '73. G. Price d. '70	3	46	8	19	10	51	11	56
28	Tu	☽ 10.1 M.	3	47	8	19	After		Morn	
29	W	Ferrous-oxalate Develop. pub. 1877	3	47	8	19	1	26	0	22
30	Th	Frank Howard d. 1866	3	48	8	18	2	43	0	49

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JUNE.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	W	Edinburgh Society, North Staffordshire	
2	Th	Bolton, Leeds, South London	
3	F	Yorkshire College	
4	S		
5	S	Trinity Sunday	
6	M		
7	Tu	Newcastle, Manchester Am.	
8	W		
9	Th	Birkenhead, Bradford	
10	F		
11	S		
12	S	1st Sunday after Trinity	
13	M	[London	
14	Tu	Gt. Britain, Glasgow Amateur, North	
15	W	Bristol, Bury, Hyde, Manch. C., Edin. C.	
16	Th		
17	F		
18	S		
19	S	2nd Sunday after Trinity	
20	M	Notts, Blackburn	
21	Tu		
22	W		
23	Th		
24	F		
25	S		
26	S	3rd Sunday after Trinity	
27	M		
28	Tu	Great Britain (Technical)	
29	W	Burnley	
30	Th	Liverpool Amateur, Oldham	

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JULY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	F		3 49	8 18	4 0	1 17
2	S		3 49	8 18	5 14	1 49
3	S	4th Sunday after Trinity	3 50	8 18	6 23	2 27
4	M	Philip Remele d. 1883	3 51	8 17	7 24	3 11
5	Tu	J. Nicephore Niepce d. 1833 ○ 8.34 M.	3 51	8 17	8 17	4 3
6	W	Rev. W. J. Whiting d. 1885	3 52	8 16	9 0	5 1
7	Th	Dr. Schnauss b. 1827	3 53	8 16	9 36	6 4
8	F		3 54	8 15	10 6	7 9
9	S		3 55	8 14	10 31	8 15
10	S	5th Sun. af. Trin. Daguerre d. '51	3 56	8 14	10 52	9 21
11	M		3 57	8 13	11 15	10 24
12	Tu	Wedgwood b. 1730	3 58	8 12	11 35	12 27
13	W	Abbé Moigno d. 1884 ☾ 6.57 M.	3 59	8 11	11 57	After
14	Th	Dumas b. 1800	4 0	8 10	Morn	1 35
15	F		4 2	8 9	0 21	2 41
16	S	Claudet b. 1797	4 3	8 8	0 49	3 45
17	S	6th Sunday after Trinity	4 4	8 7	1 20	4 50
18	M	V. M. Griswold (Inv. Ferrotype) d. '72	4 5	8 6	1 58	5 53
19	Tu		4 6	8 5	2 44	6 50
20	W	Collodion Pos. Process pub. '52 ● 8.50 A.	4 8	8 4	3 41	7 41
21	Th	Regnault b. 1810	4 9	8 3	4 48	8 24
22	F	Bessel b. 1784	4 10	8 2	6 1	9 1
23	S		4 12	8 1	7 18	9 33
24	S	7th S. af. Trin. Capt. Abney b. '43	4 13	7 59	8 37	10 1
25	M		4 15	7 58	9 56	10 28
26	Tu	Nièpce de St. Victor b. 1806	4 16	7 57	11 15	10 54
27	W	☽ 2.30 A.	4 17	7 55	After	11 22
28	Th		4 19	7 54	1 49	11 52
29	F	Secchi b. 1818	4 20	7 52	3 2	Morn
30	S		4 22	7 51	4 11	0 27
31	S	8th Sun. af. Trin. Wohler b. 1800	4 23	7 49	5 15	1 8

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JULY.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	F	Derby, Halifax	
2	S		
3	S	4th Sunday after Trinity	
4	M	Notts, Photo. Convention in Glasgow	
5	Tu	N. London, Glos. Dale, Holmfirth, Sutton	
6	W	North Staffordshire	
7	Th		
8	F	Yorkshire College	
9	S		
10	S	5th Sunday after Trinity	
11	M		
12	Tu	Manchester Amateur	
13	W		
14	Th	Birkenhead	
15	F		
16	S		
17	S	6th Sunday after Trinity	
18	M		
19	Tu	Glasgow Amateur, North London	
20	W	Bristol, Bury, Hyde, Manchester Club	
21	Th		
22	F		
23	S		
24	S	7th Sunday after Trinity	
25	M	Notts	
26	Tu	Great Britain (Technical)	
27	W	Burnley	
28	Th	Liverpool Amateur, Oldham	
29	F		
30	S		
31	S	8th Sunday after Trinity	

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AUGUST.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	M		4 25	7 48	6 10	1 56
2	Tu	Stromeyer b. 1776	4 26	7 46	6 55	2 51
3	W	Mungo Ponton d. 1880 ○ 8.40 A.	4 28	7 44	7 34	3 51
4	Th		4 29	7 43	8 7	4 55
5	F	Wollaston b. 1766	4 31	7 41	8 34	6 0
6	S	Rose b. 1795	4 32	7 39	8 56	7 6
7	S	9th Sun. af. Trin. Berzelius d. '48	4 34	7 37	9 19	8 10
8	M	Roger Fenton d. 1869	4 35	7 36	9 40	9 14
9	Tu		4 37	7 34	10 1	10 18
10	W	Jabez Hughes d. 1884	4 38	7 32	10 24	11 22
11	Th	E. A. Hadow d. 1866 ☾ 11.37 A.	4 40	7 30	10 49	After
12	F	J. H. Fitzgibbon d. 1882	4 42	7 28	11 18	1 28
13	S	Prof. Stokes b. 1819	4 43	7 26	11 52	2 33
14	S	10th S. af. Trin. Daguerreotype	4 45	7 24	Morn	3 36
15	M	[Proc. pat. '39	4 46	7 22	0 34	4 35
16	Tu	Lavoisier b. 1743	4 48	7 20	1 25	5 29
17	W		4 49	7 18	2 27	6 16
18	Th	Dr. Woodward (photo-microscopist) d.	4 51	7 16	3 37	6 56
19	F	[1884 ● 5.39 M.	4 53	7 14	4 54	7 31
20	S	Prof. Tyndall b. 1820	4 54	7 12	6 14	8 2
21	S	11th Sun. af. Trin. Chevreul b. 1786	4 56	7 10	7 36	8 30
22	M	Sir Frederick Pollock d. 1870	4 57	7 8	8 58	8 57
23	Tu		4 59	7 7	10 18	9 25
24	W	Cutting (Introd. of Ambrotype) d. '67	5 1	7 4	11 37	9 55
25	Th	Faraday d. 1867. ☽ 8.21 A.	5 2	7 2	After	10 29
26	F	Paul Pretsch d. 1873. Daguerre Me-	5 4	7 0	2 4	11 8
27	S	[morial uncovered, 1883	5 5	6 58	3 9	11 54
28	S	12th Sunday after Trinity	5 7	6 55	4 6	Morn
29	M	Varrentrapp b. 1815	5 9	6 53	4 55	0 46
30	Tu	Oliver Sarony d. 1879	5 10	6 51	5 35	1 44
31	W	Helmholtz b. 1821	5 12	6 48	6 8	2 45

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AUGUST.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	M	Notts	
2	Tu	N. London, Glos. Dale, Holmfirth, Sutton	
3	W	North Staffordshire	
4	Th		
5	F	Derby, Halifax	
6	S		
7	S	9th Sunday after Trinity	
8	M		
9	Tu	Manchester Amateur	
10	W		
11	Th	Birkenhead	
12	F		
13	S		
14	S	10th Sunday after Trinity	
15	M	Notts	
16	Tu	Glasgow Amateur, North London	
17	W	Bristol, Bury, Hyde, Manchester Club	
18	Th		
19	F		
20	S		
21	S	11th Sunday after Trinity	
22	M		
23	Tu	Great Britain (Technical)	
24	W		
25	Th	Liverpool Amateur, Oldham	
26	F		
27	S		
28	S	12th Sunday after Trinity	
29	M		
30	Tu		
31	W	Burnley	

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SEPTEMBER.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	Th	Norris's Dry-plate Process pat. 1856	5 13	6 47	6 37	3 49
2	F	William Blair drowned, '71 ○ 11.13 M.	5 15	6 45	7 2	4 55
3	S		5 17	6 42	7 24	6 0
4	**S**	13th S. af. Trin. Woodbury d. '85	5 18	6 40	7 44	7 3
5	M	Pantascope Camera pat. 1862	5 20	6 38	8 5	8 7
6	Tu		5 21	6 36	8 27	9 11
7	W	Poitevin Memorial inaugurated, 1885	5 23	6 33	8 50	10 14
8	Th	First Exp. in Gelatino-bromide p. '71	5 24	6 31	9 17	11 17
9	F	Collodio-bromide Process pub. 1864	5 26	6 29	9 49	After
10	S	☾ 3.3 A.	5 28	6 26	10 27	1 23
11	**S**	14th Sunday after Trinity	5 29	6 24	11 12	2 22
12	M		5 31	6 22	Morn	3 17
13	Tu		5 33	6 20	0 7	4 6
14	W	Humboldt b. 1769	5 34	6 17	1 12	4 48
15	Th		5 36	6 15	2 26	5 25
16	F	J. L. Gihon d. '78. Prof. Graham d. '69	5 37	6 13	3 45	5 58
17	S	Fox Talbot d. 1877 ● 2.0 A.	5 39	6 10	5 7	6 28
18	**S**	15th S. af. Trin. Leon Foucalt b. '19	5 40	6 8	6 30	6 56
19	M	T. Grubb d. 1878	5 42	6 6	7 54	7 24
20	Tu	Talbot's Disc. of Develop. '40. F. A.	5 44	6 3	9 17	7 54
21	W	Stas b. 1813 [Wilde d. '83	5 45	6 1	10 37	8 27
22	Th	Faraday b. 1791. Thos. Sutton b. '19	5 47	5 59	11 52	9 5
23	F	Woodbury Proc. p. '64. Fizeau b. 1783	5 49	5 56	After	9 50
24	S	Wothlytype Process pat. 1864 ☽ 5.4 M.	5 50	5 54	2 3	10 40
25	**S**	16th S. af. Trin. Dr. Van Monck-	5 52	5 52	2 54	11 37
26	M	[hoven b. 1834, d. '82	5 53	5 50	3 36	Morn
27	Tu	Kolbe b. 1818	5 55	5 47	4 11	0 38
28	W	H. Negretti d. 1879	5 57	5 45	4 41	1 41
29	Th	Courtois (Discoverer of Iodine) d. '38	5 58	5 43	5 7	2 46
30	F	Balard (Discoverer of Bromine) b. '02	6 0	5 40	5 29	3 50

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SEPTEMBER.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	Th	Bolton	
2	F	Derby, Halifax	
3	S		
4	S	13th Sunday after Trinity	
5	M	Notts	
6	Tu	N. London, Glos. Dale, Holmfirth, Sutton	
7	W	North Staffordshire	
8	Th	Birkenhead	
9	F		
10	S		
11	S	14th Sunday after Trinity	
12	M		
13	Tu	Manchester Amateur	
14	W		
15	Th		
16	F		
17	S		
18	S	15th Sunday after Trinity	
19	M	Notts	
20	Tu	North London, Glasgow Amateur	
21	W	Bristol, Bury, Hyde, Manchester Club	
22	Th		
23	F		
24	S		
25	S	16th Sunday after Trinity	
26	M		
27	Tu	Great Britain (Technical)	
28	W	Burnley	
29	Th	Liverpool Amateur, Oldham	
30	F		

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OCTOBER.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	S		6 2	5 38	5 50	4 55
2	S	17th Sun. after Trinity. ○ 3.47 M.	6 3	5 36	6 11	5 59
3	M	[Arago d. 1853	6 5	5 34	6 32	7 2
4	Tu		6 7	5 31	6 54	8 5
5	W		6 8	5 29	7 20	9 9
6	Th		6 10	5 27	7 49	10 12
7	F		6 12	5 25	8 23	11 14
8	S	Fr. Bollman d. 1863	6 13	5 22	9 6	After
9	S	18th Sunday after Trinity	6 15	5 20	9 56	1 10
10	M	☾ 4.57 M.	6 17	5 18	10 55	2 0
11	Tu	H. T. Anthony d. 1884	6 18	5 16	Morn	2 43
12	W	Gmelin b. 1792	6 20	5 13	0 2	3 21
13	Th		6 22	5 11	1 16	3 55
14	F		6 23	5 9	2 35	4 25
15	S	Kaulback b. 1805	6 25	5 7	3 57	4 53
16	S	19th Sunday after Trinity ● 10.35 A.	6 27	5 5	5 21	5 21
17	M	Reaumur d. 1757	6 29	5 3	6 46	5 50
18	Tu	Schonbein b.1799. Wheatstone d.'75	6 30	5 0	8 10	6 21
19	W		6 32	4 58	9 31	6 58
20	Th		6 34	4 56	10 46	7 41
21	F		6 35	4 54	11 54	8 31
22	S		6 37	4 52	After	9 27
23	S	20th Sunday after Trinity ☽ 5.46 A.	6 39	4 50	1 37	10 28
24	M		6 41	4 48	2 15	11 32
25	Tu		6 43	4 46	2 46	Morn
26	W		6 44	4 44	3 12	0 37
27	Th		6 46	4 42	3 36	1 42
28	F	Collodio-chloride of Silver pub. 1864	6 48	4 40	3 57	2 46
29	S	Talbot Photo-engraving Proc. pat.'52	6 50	4 38	4 17	3 50
30	S	21st Sunday after Trinity	6 51	4 36	4 38	4 54
31	M	John Glover d. 1864 ○ 9.31 A.	6 53	4 35	4 57	5 57

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OCTOBER.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	S		
2	S	17th Sunday after Trinity	
3	M	Notts [Holmfirth, Cov.	
4	Tu	Carl.,Glos.D.,N.Lond.,Shef.,Sutt.,Paisly.,	
5	W	Edinburgh Society, North Staffordshire	
6	Th	Bolton, Dundee, Glas. A., Leeds, S. London	
7	F	Derby, Halifax Soc., Yorkshire College	
8	S		
9	S	18th Sunday after Trinity	
10	M		
11	Tu	Newcastle, Manchester Amateur	
12	W		
13	Th	B'head, Bradford, Halifax C., Manch. Soc.	
14	F	Ireland	
15	S		
16	S	19th Sunday after Trinity	
17	M	Notts	
18	Tu	Glasgow Amateur, North London	
19	W	Bristol, Bury, Edin. C., Hyde, Manch. C.	
20	Th		
21	F		
22	S		
23	S	20th Sunday after Trinity	
24	M		
25	Tu	Great Britain (Technical)	
26	W	Burnley	
27	Th	Burton, Liverpool Amateur, Oldham	
28	F		
29	S		
30	S	21st Sunday after Trinity	
31	M		

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NOVEMBER.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	Tu		6 55	4 33	5 23	7 1
2	W	W. H. Rulofson d. 1878	6 57	4 31	5 51	8 5
3	Th		6 58	4 29	6 24	9 8
4	F	Mohr b. 1806	7 0	4 27	7 3	10 9
5	S		7 2	4 25	7 49	11 6
6	S	22nd S. af. Trin. Senefelder b. 1771	7 4	4 24	8 45	11 58
7	M	Dubois Raymond b. 1818	7 6	4 22	9 48	After
8	Tu	F. Zollner b. 1834 ☾ 5.2 A.	7 7	4 20	10 57	1 22
9	W	Pretsch's Photo-engraving Proc. p. '54	7 9	4 19	Morn	1 55
10	Th	Silvester Laroche d. 1886	7 11	4 17	0 13	2 25
11	F	Willis's Aniline Process pat. 1864	7 13	4 16	1 30	2 52
12	S		7 14	4 14	2 50	3 19
13	S	23rd Sunday after Trinity	7 16	4 13	4 12	3 46
14	M		7 18	4 11	5 36	4 15
15	Tu	● 8.8 M.	7 20	4 10	7 0	4 49
16	W	Lavater d. 1741	7 21	4 8	8 19	5 29
17	Th	C. B. Vignoles d. 1875	7 23	4 7	9 34	6 16
18	F	Daguerre b. 1787	7 25	4 6	10 39	7 11
19	S	Thorwalsden b. 1770	7 27	4 5	11 32	8 13
20	S	24th S. af. Trin. Prof. Draper d. '82	7 28	4 3	After	9 18
21	M		7 30	4 2	0 49	10 24
22	Tu	Schlippe b. 1749 ☽ 10.43 M.	7 32	4 1	1 17	11 30
23	W	Harrison (Inv. of the Globe Lens) d. '64	7 33	4 0	1 41	Morn
24	Th	Prof. Silliman d. 1864	7 35	3 59	2 3	0 35
25	F	J. B. Hockin d. '69. Gustav Re b. '35	7 36	3 58	2 23	1 40
26	S		7 38	3 57	2 44	2 43
27	S	1st Sun. in Advent. Celsius b. 1701	7 40	3 56	3 5	3 46
28	M	Sutton's Panoramic Camera pat. '59	7 41	3 55	3 27	4 51
29	Tu	Window d. 1875	7 42	3 54	3 53	5 56
30	W	○ 3.20 A.	7 44	3 53	4 24	7 0

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NOVEMBER.

D. M.	D. W.	Meetings of Societies, &c.	Memoranda.
1	Tu	Carl., Glos. D., N. Lond., Shef., Sutt., Paisly.,	
2	W	Edin. Soc., N. Staff. [Holmfirth, Cov.	
3	Th	Bolton, Dundee, Glas. A., Leeds, S. Lond.	
4	F	Derby, Halifax Soc., Yorkshire College	
5	S		
6	**S**	22nd Sunday after Trinity	
7	M	Notts	
8	Tu	Newcastle, Manchester Am., Gt. Britain	
9	W		
10	Th	Bradford, B'head, Halifax C., Manch. Soc.	
11	F	Ireland	
12	S		
13	**S**	23rd Sunday after Trinity	
14	M		
15	Tu	North London, Glasgow Amateur	
16	W	Manch. C., Hyde, Bristol, Bury, Edin. C.	
17	Th		
18	F		
19	S		
20	**S**	24th Sunday after Trinity	
21	M	Notts	
22	Tu	Great Britain (Technical)	
23	W		
24	Th	Burton, Liverpool Amateur, Oldham	
25	F		
26	S		
27	**S**	1ſt Sunday in Advent	
28	M		
29	Tu		
30	W	Burnley	

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DECEMBER.

D. M.	D. W.	Remarkable Events.	SUN. Rises.		MOON. Rises.	
			Rises. H. M.	Sets. H. M.	Rises. After.	Sets. Morn.
1	Th	Klaproth b. 1743	7 45	3 53	5 1	8 1
2	F		7 47	3 52	5 45	9 2
3	S		7 48	3 52	6 38	9 58
4	S	2nd Sun. in Advent. Galvani d. 1798	7 50	3 51	7 39	10 45
5	M		7 51	3 51	8 45	11 25
6	Tu	Obernetter's Chromo-photography p.	7 52	3 50	9 58	After
7	W	[1864. Guy Lussac b. 1778	7 53	3 50	11 14	0 29
8	Th	Will (Chemist) b. 1812 ☾ 3.11 M.	7 55	3 49	Morn	0 56
9	F	Scheele b. 1742. Duc de Luynes d. '67.	7 56	3 49	0 31	1 22
10	S	[Grasshof d. 1871	7 57	3 49	1 50	1 47
11	S	3rd S. in Ad. Sir D. Brewster b. 1781	7 58	3 49	3 10	2 14
12	M	Reade d. 1870	7 59	3 49	4 31	2 44
13	Tu	First Photo-enamel Process pat. '54	8 0	3 49	5 51	3 20
14	W	Barreswil b. 1817. ● 7.22 A.	8 1	3 49	7 9	4 2
15	Th		8 2	3 49	8 19	4 52
16	F	H. Greenwood d. '84. T. Ross d. '70	8 3	3 49	9 19	6 52
17	S	Sir Humphry Davy b. 1778	8 3	3 49	10 9	6 57
18	S	4th Sunday in Advent	8 4	3 49	10 48	8 5
19	M	Mawson k. 1867	8 5	3 50	11 19	9 13
20	Tu	Pyrogallic Acid intro. as a Developer	8 5	3 50	11 45	10 20
21	W	[by Archer, 1851	8 6	3 51	After	11 25
22	Th	Wollaston d. 1828 ☽ 7.1 M.	8 7	3 51	0 30	Morn
23	F		8 7	3 52	0 49	0 30
24	S		8 7	3 52	1 9	1 34
25	S	Christmas Day. Sir I. Newton b. 1642	8 8	3 53	1 31	2 38
26	M		8 8	3 53	1 56	3 43
27	Tu	A. Claudet d. 1867	8 8	3 54	2 24	4 46
28	W	J. T. Goddard d. 1866	8 8	3 55	2 58	5 50
29	Th		8 9	3 56	3 40	6 53
30	F	J. H. Dallmeyer d. 1883 ○ 8.14 M.	8 9	3 57	4 30	7 51
31	S	A. Braun d. 1877. C. Waldack d. 1882	8 9	3 58	5 30	8 41

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DECEMBER.

D. M.	D. W.	MEETINGS OF SOCIETIES, &c.	MEMORANDA.
1	Th	S. Lond., Leeds, Glas. A., Dundee, Bolton	
2	F	Derby, Halifax Soc., Yorkshire College	
3	S		
4	**S**	2nd Sunday in Advent	
5	M	Notts	
6	Tu	Carl.,Glos.D.,N.Lond.,Shef.,Sutt.Paisly.,	
7	W	Edin. Soc., N. Staff. [Holmfirth, Cov.	
8	Th	Bradford, B'head, Halifax C., Manch. Soc.	
9	F	Ireland	
10	S		
11	**S**	3rd Sunday in Advent	
12	M		
13	Tu	Newcastle, Manchester Am., Gt. Britain	
14	W		
15	Th		
16	F		
17	S		
18	**S**	4th Sunday in Advent	
19	M	Notts	
20	Tu	North London, Glasgow Amateur	
21	W	Manch. C., Hyde, Bristol, Bury, Edin. C.	
22	Th	Burton	
23	F		
24	S		
25	**S**	Christmas Day	
26	M		
27	Tu	Great Britain (Technical)	
28	W		
29	Th	Liverpool Amateur, Oldham	
30	F		
31	S		

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Treasurer—Henry Littlejohn.
Secretary—James W. Mackie, 10 South Mount Street, Aberdeen.

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Amateur Photographic Association.

ESTABLISHED 1861.

President—His Royal Highness the Prince of Wales.

Vice-Presidents—His Grace the Archbishop of York, The Most Noble the Marquis of Drogheda, Lieut.-General the Right Hon. the Lord de Ros, The Right Hon. the Earl of Rosse, F.R.S.

Council—Arthur Farre, Esq., M.A., M.D., F.R.S., James Glaisher, Esq., F.R.S., F.R.A.S., &c. (*Referee*), Captain J. C. A. Lewis, M.A. (*Cantab.*), Charles Stephens, Esq., M.A. (*Oxon.*), W. D. Howard, Esq., F.I.C. (*Referee*), Walter Wood, Esq., F.R.H.S., W. S. Hobson, Esq.

Hon. Secretary—Mr. Arthur James Melhuish, F.R.A.S., and F.R. Met. Soc.
Executive Artist—Mr. Alexander Bassano.
Offices—25 Old Bond Street, London, W.

◆

Amateur Photographic Field Club.

ESTABLISHED 1853.

President—S. Conway.
Secretary—W. Wainwright, jun., Hoe Place, Woking.

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WITH SWING, ROSE TAP, &c.

Awarded Photographic Society's Medal. See Advertisement, page 166.

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Birkenhead Photographic Association.

Established 1884.

Ordinary Meetings, second Thursday in each month at half-past Seven p.m. Annual Meeting, second Thursday in November at half-past Seven p.m. Place of Meeting, Free Public Library, Hamilton Street, Birkenhead.

President—J. Alexander Forrest.

Vice-President—H. Norwood Atkins.

Council—A. W. Cornish, E. Newall, J. H. Day, J. M. Jones, G. A. Kenyon, M.D., P. Lange, P. H. Phillips, B. J. Sayce, E. Whalley.

Auditors—A. W. Beer and R. W. Hill.

Treasurer—T. Cragg James, 80 Argyle Street, Birkenhead.

Secretary—G. A. Carruthers, Lonsdale, Woodhey, Rock Ferry.

Birmingham Photographic Society.

Established 1885.

Meetings at the Technical Schools, Bridge Street, Birmingham, at half-past Seven p.m. on the second and fourth Thursday of each month excepting April, May, June, July, August, and September, when they are held on the fourth Thursday only. Annual Meeting, the fourth Thursday in November.

President—R. H. Norris, M.D.

Vice-Presidents—W. J. Harrison, F.G.S., and J. C. Huxley, M.D.

Council—F. Birkett, S. Delicate, J. P. Heaton, S. J. Holliday, E. H. Jaques, H. Lucas, W. Osborn, R. P. Taylor.

Treasurer—G. M. Iliff.

Joint Hon. Secretaries—B. Karleese and J. H. Pickard, Technical Schools, Bridge Street, Birmingham.

Blackburn Literary Club (Photographic Section).

Established 1884.

Each Section of the Club is managed by its own Secretary. Meetings and Excursions at intervals during the season.

President—T. J. Syckelmoore, B.A.

Vice-President—Charles Smithies.

Hon. Secretary—E. S Johnson, Literary Club, Blackburn,

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Bolton Photographic Club.

ESTABLISHED 1883.

Meetings are held every Tuesday Evening, at the Studio of the Club, Chancery Lane, Bolton, at Eight o'clock p.m.

President—Jabez Boothroyd.
Vice-President—Thomas Jukes.
Committee—Messrs. Hawksworth, Banks, Bradshaw, Ashworth, Sewell.
Treasurer—John Bradshaw.
Secretary—James Slater, Town Hall Square, Bolton.

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Bolton Photographic Society.

ESTABLISHED 1879.

Ordinary Meetings on first Thursday in each month from September to May inclusive, at Eight p.m. Annual Meeting, first Thursday in October.

President—J. R. Bridson.
Vice-Presidents—E. N. Ashworth, Rev. J. W. Cundey, M.A., R. Harwood, J. W. Hawksworth, T. Parkinson.
Council—W. Banks, R. Mercer, J. Slater, W. Knowles.
Treasurer—C. K. Dalton.
Secretary—B. H. Abbatt, 12 Corporation Street, Bolton.

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Bradford Amateur Photographic Society.

ESTABLISHED 1884.

Meetings, second Thursday in the month, at the Grammar School.

President—Duncan G. Law.
Committee—M. Wallace, F. B. Muff, H. Forsyth, J. Cotton, J. Haworth.
Treasurer—W. S. Smith.
Secretary—G. D. Scorah, 11 Leeds Road, Bradford.

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Bristol and West of England Amateur Photographic Association.

RE-ESTABLISHED 1876.

Meetings at Queen's Hotel, third Wednesday in each month, at half-past Seven p.m. Annual Meeting in January.

President—Thomas Davey.
Vice-Presidents—Colonel Playfair and Rev. H. B. Hare.
Council—The Officers and W. W. Boyden, J. Phillips, W. B. Wright.
Treasurer—Edward Brightman.
Secretary—H. A. Hood Daniel, F.S.I., Bank Chambers, Corn Street, Bristol.

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British Association for the Advancement of Science,

22 Albemarle Street, London, W.

Established 1831.

The next Annual Meeting will be held at Manchester, August 31, 1887.

President—Sir J. William Dawson, C.M.G., F.R.S.

President Elect—Sir H. E. Roscoe, M.P., F.R.S.

General Treasurer—Professor A. W. Williamson, F.R.S.

General Secretaries—Captain Douglas Galton, C.B., F.R.S., and A. G. Vernon Harcourt, F.R.S.

Secretary—A. T. Atchison, M.A.

Burnley and District Amateur Photographic Society.

Established 1885.

The usual Meetings are held on the last Wednesday of January, February, March, April, October, November, December. Annual Exhibition on January 28 and 29.

President—D. Drew.

Vice-President—J. Butterworth.

Committee—Hartley Jackson, J. Pickles, J. W. Houlden, William Sutcliffe.

Hon. Treasurer—Hartley Jackson.

Hon. Secretary—William Sutcliffe, 7 Bank Hall Terrace Burnley.

Burton-on-Trent Institute Amateur Photographic Association.

Established 1884.

President—Rev. J. Bramell.

Council—T. Gill, T. Gretton, J. Stirk.

Treasurer—A. R. Siddels.

Hon. Secretary—Samuel Sims, 56 Branstone Road, Burton-on-Trent.

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Bury Photographic and Arts Club.

ESTABLISHED 1882.

Ordinary Meetings held third Wednesday in each month. Annual Meeting, third Wednesday in October.

President—F. W. Livsey.
Vice-Presidents—H. Dearden and W. S. Barlow.
Council—E. W. Mellor, R. Grundy, J. Shaw, J. Taylor, J. Nelson.
Treasurer—Alexander Taylor.
Secretary—C. Openshaw, Moss Field, Bury.

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Cambridge University Photographic Society.

ESTABLISHED 1881.

Meetings are held every Term at times appointed by the Committee; they are held in the Rooms of any Member who will read a paper on any subject connected with photography. The Society's premises are at 26 Lower Park Street, Cambridge, where there is a studio and dark rooms for the use of Members.

President—A. Scott, M.A. (Trinity).

Committee—The Rev. C. S. Chapman, M.A. (Emmanuel), M. Ogilvy, B.A. (Trinity), H. M. Elder, B.A. (Trinity), A. Kidd (Trinity), with President and Secretary.

Secretary and Treasurer—A. Hamilton (Christ's), Christ's College, Cambridge University.

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Carlisle and County Amateur Photographic Society.

ESTABLISHED 1885.

Field Meetings on alternate Saturdays in April, May, June, July, August, September. Indoor Meetings on the first Tuesday in October, November, December, January, February, March. Annual General Meeting in February.

President—The Mayor of Carlisle.
Vice-President—C. S. Hall, M.R.C.S., F.R.M.S.

Committee—F. Ritson, C. A. Coward, J. G. Moffett, J. Kirkpatrick, T. Waugh, T. Bushby.

Treasurer—John Forsyth.
Secretary—H. Y. Thompson, L.S.A.L., Brampton, Cumberland.
Assistant Secretary—Joseph Simpson, 41 Castle Street, Carlisle.

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Cheltenham Photographic Society.

ESTABLISHED 1865.

Meetings are held on the second Thursday in each month, from November to April, both inclusive, at 4 Clarence Street, at half-past Seven p.m. Annual General Meeting in November.

President—Major-General Francis Dawson, C.B.
Committee—Baynham Jones, G. S. Penny, W. C. Beetham, and the Officers.
Treasurer—John Bull.
Secretary—Clifford E. F. Nash, M.A., Glenfall Lawn, Cheltenham.

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Coventry and Midland Photographic Society.

ESTABLISHED 1883.

The Ordinary Meetings are held at the Coventry Dispensary, at Eight o'clock p.m., on the first Tuesday in each month. Annual Meeting in November.

President—Councillor Andrews.
Vice-Presidents—H. W. Jones, M. J. Danks, C. Ambrose, and A. Seymour.
Committee—T. Baynton, T. J. Lloyd, E. J. Walker, G. Winstanley, and the Officers.
Treasurer—J. M. J. Danks.
Secretary—J. S. Weaterell, Spring Hill House, Keresley, Coventry.

◆

Derby Photographic Society.

ESTABLISHED 1884.

Meetings held first Friday in each month, at half-past Seven p.m., in School of Art, Green Hill, Derby. Annual Meeting first Friday in December.

President—Captain W. de W. Abney, R.E., &c.
Vice-Presidents—Henry Bolden, Arthur J. Cox, Richard Keene.
Committee—Charles Bourdin, Theodore Hills, John C. Merry, J. W. Price, Thomas Scotton.
Treasurer and Secretary—James E. Kaye, Wilson Street, Derby.

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Dundee and East of Scotland Photographic Association.

Established 1879.

Ordinary Meetings, first Thursday in each month from October to May inclusive. Annual Meeting in May. Meetings held in Lamb's Hotel, Dundee.

Hon. President—Thos. Carnelley, D.Sc., University College, Dundee.

Acting President—W. D. Valentine.

Vice-Presidents—G. D. Macdougald, F.I.C., and J. K. Tulloch, M.B.

Council—H. G. Fraser, J. Geddes, W. F. Hill, D. Ireland, P. Kerr, jun., W. M. Martin, J. Mathewson, Leslie Ower, A. Watt, J. R. Wilson.

Treasurer—Vaness C. Baird.

Secretary—D. Ireland, jun., Rockhill, Broughty Ferry, N.B.

◆

Edinburgh Photographic Club.

Established 1881.

The Ordinary Meetings are held at 5 St. Andrew Square, at Eight o'clock p.m., on the third Wednesday of each month. The Annual Meeting on the third Wednesday of November. The Club is limited to Thirty Members.

Board of Management.

Convener—Dr. John Thomson, R.N. *Treasurer*—James C. H. Balmain.

Secretary—James Jameson, 84 Pitt Street, Edinburgh.

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Edinburgh Photographic Society.

Established 1861.

The Ordinary Meetings during session are held in the Professional Hall, 20 George Street, on the first Wednesday of each month, except July, August, and September, at Eight o'clock p.m. Annual Meeting, first Wednesday in November.

Patron—H.R.H. The Duke of Edinburgh.

President—William Forgan.

Vice-Presidents—J. G. Tunny and Charles Fraser.

Council—Hugh Brebner, T. G. Whaite, A. M. Forbes, Hippolyte J. Blanc, James Jameson, Robert H. Bow, James Lessels, William T. Bashford, J. C. H. Balmain, F. Briglmen, John Hay, Alexander A. Inglis.

Hon. Curator—Samuel Tamkin. *Hon. Treasurer*—Thomas Wardale.

Hon. Secretary—G. G. Mitchell, 3 Gladstone Place.

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Glasgow Photographic Association.

ESTABLISHED 1862.

The Ordinary Meetings are held at the Philosophical Society's Rooms, 207, Bath Street, at Eight o'clock p.m., on the first Thursday of each month, from September to April. Annual Meeting, first Thursday in September. Election Meeting, last Thursday in April.

President—Councillor Robertson.
Vice-Presidents—Robert Dodd and John Parker.
Council—J. Craig Annan, George Mason, James McGhie, John M. Skinner, William Lang, jun., P. Falconer.
Treasurer—George Bell.
Secretary—John Lennox, 6 Armadale Street.

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Glasgow and West of Scotland Amateur Photographic Association.

ESTABLISHED 1882.

Association's Rooms, 180 West Regent Street. Dark room at disposal of amateurs visiting Glasgow. Meets third Tuesday of each month at half-past Seven p.m. Informal Meetings, every Tuesday at half-past Seven p.m. Annual Meeting in December.

President—William Lang, jun.
Vice-President—Hugh Reid.
Council—R. Cutting, C. C. Coulson, R. Dalglish, R. H. Elder, John R. Reid.
Treasurer—Hugh Reid.
Secretary—William Goodwin, 3 Lynedoch Street, Glasgow.

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Glossop Dale Photographic Society.

ESTABLISHED 1883.

Meetings held at the Society's Rooms, Norfolk Square, Glossop. Annual Meeting, first Tuesday in October. Monthly Meetings, first Tuesday in each month.

President—Captain Partington.
Vice-Presidents—James Sidebottom and J. B. Rowcliffe.
Council—Messrs. Merry, Bamforth, Broadhurst, Ridgway, Greaves.
Chairman—Mr. Greaves. *Vice-Chairman*—Mr. Merry.
Treasurer—Mr. Hardman.
Secretary—W. E. Rowcliffe, Gamesley House, Dinting.

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Under the Management of MR. ALEXANDER COWAN.

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Halifax Photographic Club.

ESTABLISHED 1881.

Meet on the second Thursday in each month from October to May inclusive at half-past Seven p.m., in the Mechanics' Hall.

President—Councillor John Smith.
Vice-Presidents—Rev. W. E. Hancock, M.A. and B. Rowley.
Treasurer—E. A. Caw.
Secretary—W. Clement Williams, 13 Akeds Road, Halifax.

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Halifax Photographic Society.

RECONSTITUTED 1885.

Meetings are held on the first Friday in every month, at M. Manley's, Optician, Barum Top, at Eight o'clock p.m. Annual meeting and election of officers on the third Friday in October.

President—F. H. Bowman, D. Sc., F.R.S.E., &c.
Vice-Presidents—E. Gledhill, John R. Farrar.
Council—S. Worsnip, W. Ward, T. H. K. Lees M. Manley.
Treasurer—J. I. Learoyd.
Hon. Secretary—Luther Hanson, 36 North Parade, Halifax.

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Holmfirth Amateur Photographic Association.

ESTABLISHED 1885.

Meetings are held monthly on the first Tuesday of each month at half-past Seven, at the residences of each member in succession.

Council—The Members of the Association.
Hon. Treasurer—Thomas Brownson.
Hon. Secretary—Thomas Brownson, Binn Villa, Holmfirth.

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Hull Amateur Photographic Society.

ESTABLISHED 1883.

President—Sir Albert Kaye Rollit.
Vice-President—D. Sissons.
Council—C. F. Amos, A. S. Ayre, D. G. Joy, G. Shackles, H. W. R. Smith, B. M. Stoakes, E. H. Howlett, Peters.
Treasurer—H. W. R. Smith, Crown Terrace, Auleby Road.
Secretaries—J. C. Thompson, Crown Terrace, Auleby Road, and J. Stothard, Dalton House, Walker Street.

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A VARIETY of
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Hyde Photographic Society.

ESTABLISHED 1884.

Annual Meeting, third Wednesday in October. Meetings every third Wednesday, in the Mechanics' Hall, Hyde.

President—Dr. G. W. Sidebotham. *Vice-President*—F. W. Cheetham.
Committee—J. T. Cartwright, W. H. Hulme, H. Stafford, Charles Bancroft.
Auditors—C. S. Ingham and W. H. Middleton.
Treasurer—John H. Brooks.
Secretary—John Pennington, Great Norbury Street, Hyde.

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Leeds Photographic Society.

RE-ESTABLISHED 1881.

Ordinary Meetings, first Thursday in each month, at Eight o'clock, in the Philosophical Hall. Annual Meeting, December.

President—A. W. Rücker, F.R.S.
Vice-Presidents—Colonel Harding and Washington Teasdale, F.R.M.S.
Committee—Messrs. Branson, Dawson, Denham, Rodwell, Warburton, and the Officers of the Society. *Treasurer*—J. W. Reffitt.
Secretary—Thomas W. Thornton, 22 Carr Road, Leeds.

◆

Liverpool Amateur Photographic Association.

ESTABLISHED 1886.

Meetings held at the Royal Institution, Colquilt Street.

President—P. H. Phillips, 476 New Chester Road, Rock Ferry, Liverpool.
Vice-Presidents—E. Twigge and G. H. Rutter.
Council—Rev. T. B. Banner, A. W. Beer, B. Boothroyd, R. Crowe, J. H. Day, W. H. Kirkby, J. W. Kirby, Rev. H. J. Palmer, F. T. Paul, F.R.C.S. W. Rogers, Rev. A. T. Scott, W. A. Watts.
Librarian—W. W. Hughes. *Auditor*—W. H. Wharmby.
Hon. Treasurer—J. H. T. Ellerbeck, 54 Bold Street, Liverpool.
Hon. Secretary—W. A. Watts, Charlesville, Farnworth-in-Widnes, near Liverpool.

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Manchester Amateur Photographic Club.

ESTABLISHED 1884.

Committee—J. T. Foster, T. Sefton, R. B. Wilson, J. W. Leigh, T. W. Steventon.
Treasurer—E. Openshaw.
Secretary—E. Openshaw, 24 Ward's Buildings, Deansgate, Manchester.

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London and Provincial Photographic Association.

ESTABLISHED 1882.

Members meet every Thursday evening, at Eight o'clock, at Mason's Hall Tavern, Mason's Avenue, E.C. Committee Meeting, last Thursday in each month after the ordinary Meeting, when all members present constitute the Committee.

Trustees—W. Cobb and J. B. B. Wellington.
Curator—A. Haddon.
Treasurer—W. H. Prestwich.
Secretary—J. J. Briginshaw, Albert Road, Walthamstow.

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Manchester Amateur Photographic Society.

ESTABLISHED 1885.

The Ordinary Meetings on the second Tuesday in each month, at the Masonic Hall, Cooper Street, Manchester. Annual Meeting last Tuesday in January.

President—Rev. H. J. Palmer, M.A.
Vice-Presidents—T. Harrison, F.C.S., and John Tatham, M.D., B.A.
Committee—John Bathe, Jas. Blair, A. W. Duncan, S. F. Flower, A. Hay, W. Lane, G. H. Rigby, William Stanley, T. Widdop, R. B. Wilson.
Treasurer—J. G. Jones. *Librarian*—Robert Graham
Secretary—F. W. Parrott, 53 Chapel Street, Salford.

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Manchester Photographic Society.

ESTABLISHED 1855.

Meetings held at 36 George Street, second Thursday in month from September to May inclusive, at half-past Six. Annual Meeting, October. Outdoor Meetings fortnightly from May to October.

Lantern Committee.—Established 1885.—Meetings, fourth Wednesday from September to March inclusive.

President—A. Coventry.
Vice-Presidents—Canon Beechey, J. S. Pollitt, S. D. McKellen, Abel Heywood, jun., Allan Garnett.
Council—Jos. Greatorex, A. Brothers, J. Schofield, O. Muth, N. Wright, Dr. C. P. Bahin, R. Atherton, Thos. Chilton, J. G. Jones, S. F. Flower.
Treasurer—W. G. Coote.
Secretary—W. I. Chadwick, Grosvenor Square, Brooklands, Manchester.
Lantern Section Committee—W. I. Chadwick, F. S. Flower, Jos. Greatorex, J. G. Jones, O. Muth, J. Schofield, W. Watts.

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Newcastle-on-Tyne and Northern Counties' Photographic Association.

ESTABLISHED 1881.

Meetings held at the College of Physical Science, Newcastle, on the second Tuesday of each month, except June, July, August, and September.

President—Professor A. S. Herschel, M.A., &c.

Vice-Presidents—Alex. Shannon Stevenson, J.P., and J. Buxton Payne, F.R.M.S.

Council—Messrs. W. Armstrong, Auty, Downey, W. C. Fletcher, Galloway, J. P. Gibson, Jackson, H. R. Procter, Sawyer, Templeton.

Hon. Treasurer—P. M. Laws, 38 Blackett Street, Newcastle.

Hon. Secretary—J. Pike, 16 New Bridge Street, Newcastle.

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North London Amateur Photographic Association.

ESTABLISHED 1885.

The Ordinary Meetings are held on the first and third Tuesday in every month at Myddelton Hall, Upper Street, Islington, N. Annual Meeting, third Tuesday in January. Excursions every Saturday afternoon from Easter to Michaelmas.

President—John Humphries.

Vice-President—John Oakley.

Committee—Messrs. Few, Treadway, Roper, Medland, Hiscock, Beckett.

Treasurer—J. Henry Bridgman.

Hon. Secretary—H. M. Smith, 5 Beatrice Road, Stroud Green, N.

◆

North Staffordshire Amateur Photographic Association.

ESTABLISHED 1883.

Meetings held at the Mechanics' Institute, Hanley, on first Wednesday in each month, at Eight p.m. Annual Meeting in November.

President—Charles Alfieri.

Vice-Presidents—T. Taylor and F. J. Emery.

Committee—Messrs. Insull, Burgess, Leck, Kelsall, Blackshaw.

Treasurer—W. Hampton.

Secretary—W. B. Allison, 32 West Street, The Mount, Penkhull, Stoke-on-Trent.

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Notts Photographic Association.

ESTABLISHED 1883.

Meetings at the Nottingham Institute, Shakespeare Street, on Monday evenings, first and third in each month, during the session.

President—George Shepperley.

Vice-President—Alfred Cox.

Committee—H. Blandy, L.D.S., Edin., S. Bourne, T. Carnell, W. J. Collings, B. S. Dodd, G. Pendry, A. Standley, J. K. Townsend, M. Tuquet, H. A. A. Wigley, G. E. Williamson.

Treasurer—N. W. Need.

Secretary—George Edward Inger, 7 High Street, Nottingham.

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Oldham Photographic Society.

ESTABLISHED 1867.

The Ordinary Meetings are held at the Lyceum on the last Thursday in each month, at Eight o'clock p.m. The Annual Meeting is held on the last Thursday in October.

President—Alfred Knott.

Vice-President—John Greaves, jun.

Council—John William Cooper, John Fullalove, James Hall, Tom Heywood, James Henry Prestwich, Edward C. Stump Alexander B. Thompson.

Librarian—Moses Piper.

Treasurer—John William Whitehead.

Secretary—Thomas Widdop, 18 Crossbank Street, Oldham.

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Oxford University Photographic Club.

ESTABLISHED 1884.

Meetings held at Eight o'clock every other Thursday or Friday during Term in the Club Rooms.

President—G. S. Edwards, 16 Crick Road.

Committee—A. Anson, H. S. Salter, Hon. Secretary, President, Treasurer.

Treasurer—Arthur P. Harper, Christ Church.

Secretary—F. W. Bennett, New College, Oxford.

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Paisley Photographic Society.

RE-ESTABLISHED 1885.

Date of Meetings, first Tuesday in each month from October till April, inclusive.

President—H. H. Smiley. *Vice-President*—James Barr.

Council—R. Cairns, R. Harris, A. Fullerton, J. Mure, G. Robertson.

Treasurer—M. Morrison.

Secretary—W. A. L. Peock, Meikleriggs, Paisley.

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Photographers' Benevolent Association.

ESTABLISHED 1873.

Ordinary Meetings as required. Annual Meeting, February, at 181 Aldersgate Street, E.C.

Trustees—Colonel Stuart Wortley and Captain W. de W. Abney.

Committee—W. M. Ashman (*Chairman*), T. J. Collins (*Deputy Chairman*), T. Bolas, H. J. Burton.

Treasurer—John Stuart, 112 New Bond Street, W.

Secretary—H. Harland, 181 Aldersgate Street, E.C., and 83 Hawksley Road, Stoke Newington, N.

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Photographic Society of Great Britain.

ESTABLISHED 1853.

The Ordinary Meetings are held at the Gallery of the Royal Society of Painters in Water Colours, 5A Pall Mall East, at Eight o'clock p.m., on the second Tuesday of each month from November to June inclusive. Annual General Meeting on the second Tuesday in February. Extra Meetings, called 'Technical Meetings,' are held on the fourth Tuesday in each month.

Patrons—Her Majesty the Queen and H.R.H. the Prince of Wales.

President—J. Glaisher, F.R.S., F.R.A.S., 1 Dartmouth Place, Blackheath, S.E.

Vice-Presidents—Captain W. de W. Abney, R.E., F.R.S., F.C.S., W. England, Colonel H. Stuart Wortley.

Council—G. L. Addenbrooke, Francis Bedford, W. Bedford, Valentine Blanchard, T. Bolas, F.C.S., W. B. Bolton, J. Cadett, William Cobb, Alexander Cowan, T. Sebastian Davis, F.C.S., W. F. Donkin, M.A., F.C.S., F.I.C., P. H. Emerson, B.A., M.B. Cantab., J. E. Mayall, F.C.S., F.R.M.S., Joseph Paget, H. P. Robinson, John Spiller, F.C.S., F.I.C., Leon Warnerke, H. Trueman Wood, M.A. *Treasurer*—Walter S. Bird.

Hon. Secretary—W. F. Donkin, M.A., F.C.S., F.I.C., 142 Sinclair Road, Hammersmith, W.

Assistant Secretary—Edwin Cocking, 5A Pall Mall East, S.W.

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Photographic Club.

ESTABLISHED 1879.

Club Rooms, Anderton's Hotel, Fleet Street, E.C. Meetings every Wednesday evening at Seven o'clock.

Trustees—W. Ackland and T. C. White.

Committee—W. Bedford, A. Cowan, E. W. Foxlee, A. Mackie, J. Nesbit, J. B. B. Wellington, J. W. Zaehnsdorf, W. Cobb.

Curator—H. M. Hastings. *Librarian*—E. Clifton.

Hon. Secretary and Treasurer—E. Dunmore, 1 Beacon Hill, N.

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Photographic Society of Ireland.

ESTABLISHED 1879.

Meetings, second Friday at Eight p.m., at the Royal College of Science, Dublin, each month except June, July, August, and September.

President—Dr. J. Emerson Reynolds, F.R.S.

Vice-President—Howard Grubb, F.R.S.

Council—Herbert Bewley, S. Baker, Thomas Mayne, M.P., George Mansfield, J.P., Greenwood Pim, John L. Robinson, John V. Robinson, Dr. Scott, Joseph H. Woodworth.

Treasurer—Thomas A. Bewley, St. Helen's, Blackrock.

Secretaries—A. Conan, 1 Carlton Villas, Shelbourne Road, and E. P. Johnson, 30 Upper Mount Street.

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Postal Photographic Society.

ESTABLISHED 1882.

Committee Meetings four times a-year and Annual General Meeting in June, held at 4 Middle Temple Lane, E.C.

President—Horace Day, M.D.

Committee—Harris Heal, H. Noel Malan, H. A. Roome, M.D., Walter Withall.

Secretary—William Mortimer Baylis, 4 Middle Temple Lane, E.C.

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Sutton Scientific Society.

ESTABLISHED 1886.

Meetings are held at Eight p.m. on the first Tuesday in every month at the Rooms of the Society, 18 High Street, Sutton, Surrey.

Photographic Sub-Committee.

Chairman—William Goode. *Recorder*—James L. McCance, F.R.A.S.

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Sheffield Photographic Society.

ESTABLISHED 1876.

Meetings, first Tuesday in the month, at the Masonic Hall, Surrey Street. Annual Meeting, October.

President—T. S. Yeomans.
Vice-Presidents—W. B. Hatfield and Dr. Morton.
Council—Messrs. Bacon, Atkins, Firth, Platts, Pearce, and the Officers.
Treasurer—C. Yeomans.
Hon. Secretary—J. Taylor, 205 Sheffield Moor, Sheffield.

Shropshire Amateur Photographic Society.

ESTABLISHED 188 .

President—E. Cresswell Peele. *Vice-President*—H. H. Hughes.
Council—W. Bowdler, Dr. E. Cureton, Rev. J. H. E. Charter, W. E. Litt, H. Mountfort, E. Lloyd Oswell, J. Pyefinch, F. W. Williams.
Treasurer—M. J. Harding.
Hon. Secretary—W. W. Naunton, 9 The Square, Shrewsbury.

South London Photographic Society.

ESTABLISHED 1859.

The Meetings are held in the Rooms of the Society of Arts, John Street, Adelphi, on the first Thursday of every month, except July, August, and September.

President—H. Trueman Wood, M.A.
Vice-Presidents—T. Bolas, E. Dunmore, F. York.
Committee—W. Ackland, W. M. Ashman, W. M. Ayres, W. K. Burton, G. C. Collins, W. Cobb, H. Compton, J. Downes, G. A. Garrett, C. Hussey, C. Poirson, H. Wilmer.
Hon. Treasurer and Secretary—F. A. Bridge, East Lodge, Dalston Lane, London, E.

Yorkshire College Photographic Club.

ESTABLISHED 1883.

The Meetings are held at half-past Seven p.m. on the first Friday in each month, except in January and April, when the Meeting is on the second Friday in the month.

Chairman—C. H. Bothamley, F.C.S.
Committee—Rev. R. W. Atkinson, M.A., H. Ingle, W. Thomas.
Hon. Secretary and Treasurer—Harry B. Hall, 89 Caledonian Road, Leeds.

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Amateur Photographic Association of Victoria.

The Ordinary Meetings are held at the Royal Society's Hall, Melbourne, on the first Monday of each month.

President—Dr. J. H. Browning.
Vice-Presidents—J. McEwan and E. C. Bell.
Committee—E. Purton, H. Vanheems, W. Himen, J. Levens, E. A. Walker.
Hon. Treasurer—J. J. Fenton.
Librarian—R. H. Taverner.
Hon. Secretary—J. H. Harvey.

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Queensland Photographic Society.

Established 1884.

Ordinary Meetings held on the 15th of each month.
President—Hon. A. C. Gregory, M.L.C., F.R.G.S.
Vice-Presidents—Professor J. H. Pepper, J. W. Sutton, W. C. Hume.
Committee—D. T. Lyons, T. Mirfin, H. W. Fox.
Librarian—F. R. Hall.
Treasurer—C. A. Gilder.
Hon. Secretary—C. M. Allen, Diocesan Registry, George Street, Brisbane.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Association of Operative Photographers of New York.—Established 1880. Meetings first and third Wednesdays each month. Annual Meeting, first Meeting in March, at Eight o'clock p.m. Meetings held at 392 Bowery. Thomas W. Power, President. Thomas C. Roche, Vice-President. D. Fields, O. Buehler, A. Mildenberger, Trustees. Emil Stoll, Treasurer. William Eddowes, Secretary, 770 Broadway, New York City. C. Sprotte, Financial Secretary. C. Faulkner, Librarian.

Baltimore Amateur Photographic Association.—Meets on the first Thursday in each month. Executive and Annual Meetings in October. John P. Bigham, President. Philip Prado, Vice-President. Arthur W. Nyce, Secretary and Treasurer, 26 North Gay Street, Baltimore, Maryland.

Boston Society of Amateur Photographers.—Established October, 1882. E. F. Wilder, President. G. E. Cabot, Vice-President. J. H. Thurston, Secretary and Treasurer.

Chicago Amateur Photographers' Club.—Established 1883. Place of Meeting, The Art Institute, Van Buren Street, and Michigan Avenue. Regular Meetings, third Monday evening in each month. Annual Meeting, third Monday in January. Dr. H. D. Garrison, President. E. Wyllys Andrews, M.D., Vice-President. Gayton A. Douglass, S. W. Burnham, G. W. Hough, Executive Committee. Henry L. Tolman (*vice* F. H. Davies, resigned), Treasurer and Secretary, *Chicago Tribune*, care of City Editor.

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AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Chicago Photographic Association.—Established 1871. Place of Meeting, 229 State Street. Ordinary Meetings, first Wednesday evening in each month. Annual Meeting, first Wednesday in January. G. H. Sherman, Elgin, Ills. Charles Gentilé and P. B. Greene, Vice-Presidents. Gayton A. Douglas, Thomas Markley, and Dr. H. D. Garrison, Executive Committee. F. H. Davies, 88 Walton Place, Chicago, Treasurer and Secretary.

Cincinatti Amateur Photographic Club.—Meets at Club Room, 24 West Fourth Street, on the first Thursday of each month. Dr. Wm. Carson, President. Dwight W. Huntington, Vice-President. Henry H. Vail, Herman Groesbeck and Charles Rule, Trustees. Chas. W. Short, Treasurer. E. J. Carpenter, Secretary, U. S. Engineer Office, 82 West Third Street.

Cleveland Amateur Photographic Association.—Meets at the residences of the Members, twice in each month, on Monday evenings, at half-past Seven o'clock. Wm. T. Higbee, President. A. H. Hough, 804 Case Avenue, Secretary and Treasurer.

Columbus (Ohio) Amateur Photographic Club.—Established October, 1884. Meets at rooms of Columbus Art School, 15 East Long Street, the first and third Monday of each month, at half-past Seven p.m. Professor N. T. Lord, President. Professor W. S. Goodnough, 101 Hamilton Avenue, Columbus, Ohio, Secretary and Treasurer.

Detroit Photographic Association.—Annual Meeting second Monday in January. Jex Bardwell, President. Albert M. Harris, Vice-President. Judge, J. J. Speed, D. Farran Henry, and Wm. Marratt, Council. William H. Allen, Treasurer. C. W. Earle, Secretary.

German Photograghic Society of New York.—Meets at 62 East Fourth Street, on the second and fourth Fridays of each month, at half-past Eight o'clock. Annual Meeting on the fourth Friday in March. Theodor Gubelman, President. Chas. F. Kutscher, Vice-President. L. Nagel, F. Bach, and A. Denniger, Trustees. G. E. Pellnitz, Treasurer. Ludwig Schill, Corresponding Secretary, 839 Broad Street, Newark, N.J.

Lowell Association of Amateur Photographers.—Established 1884. William P. Atwood, President. A. G. Walsh and C. E. Edson, Vice-Presidents. W. P. Atwood, A. G. Walsh, C. E. Edson, F. H. Pullen, and R. F. Hemenway, Committee. Frank H. Pullen, Treasurer. R. F. Hemenway, 38 Fourth Street Lowell, Secretary.

Minneapolis Amateur Photographic Club.—Established 1885. Meetings held at Room 15 Windom Block, the second Monday in each month, at Eight p.m. Annual Meeting in September. A. C. Loring, President. E. R. Shepard, Vice-President. A. C. Loring, R. D. Cleveland, O. W. Meyrowitz, Bishop Brayton, and O. H. Peck, Executive Committee. Bishop Brayton, Treasurer. R. D. Cleveland, 221 Second Avenue South, Minneapolis, Minn., Secretary.

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AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Pacific Coast Amateur Photographic Association.—Established March, 1883. Rooms, 605 Merchant Street, San Francisco. Meetings, Thursday after first Monday in every month. Annual Meeting, March. William H. Lowden, President. George Tasheira, Vice-President. Sidney M. Smith, William C. Gibbs, and William Letts Oliver, Executive Committee. Walter M. Speyer, 221 Sansome Street, San Francisco, Treasurer and Secretary.

Pennsylvania Photographic Association.—Established 1870. Time of Meeting, second Tuesday evening of each month, at 1431 Ridge Avenue, Philadelphia, Pa. Hour of Meeting, half-past Seven o'clock. John C. Steinman, President. David Marston and Thomas McCollin, Vice-Presidents. J. G. Hood, J. G. Tyson, and F. Normast, Executive Committee. John R. Clemons, Treasurer. Thomas T. Mahan, 1912 Jefferson Street, Secretary.

Philadelphia Amateur Photographic Club.—Established December, 1883. Meetings are held at Club Rooms, 907 Filbert Street, at Eight p.m., on the third Monday of each month. Howard Pusey, President. H. P. Gillingham, Vice-President. F. G. Stuart, Chairman of Executive Committee. Alfred Thompson, Treasurer. W. West Randall, 1905 Chestnut Street, Philadelphia, Secretary. Amateurs visiting our city in need of a dark room are invited to make use of ours. Rooms open day and night.

Photographers' Association of America.—Place of Meeting for 1886, Chicago, Ill. Time of Meeting to be fixed by the Executive Committee. W. H. Potter, Indianapolis, Ind., President. H. McMichael, Buffalo, N.Y., Recording Secretary. G. Cramer, St. Louis, Mo., and D. R. Clark, Indianapolis, Ind., Executive Committee. G. M. Carlisle, Providence, R.I., Treasurer. Robert Benecke, St. Louis, Mo., Local Secretary.

Photographic Section of the American Institute.—Established March 26th, 1859. Meetings are held on the first Tuesday of each month, except July and August, at the Institute, at Eight p.m. Annual Meeting, second Thursday in February. Henry J. Newton, President. John B. Gardner, Vice-President. Committee on Chemistry and Optics, Committee. Edward Schell, Treasurer. Oscar G. Mason, Photographical Department, Bellevue Hospital, New York City, Secretary.

Photographic Society of Chicago.—Established 1886. Ordinary Meetings, first Wednesday in every month, at Eight p.m. Annual Meeting, first Wednesday in January. Place of Meeting, Art Institute, Van Buren Street and Michigan Avenue. Dr. H. D. Garrison, President. G. F. Gale, G. H. Sherman, Vice-Presidents. L. W. Felt, Gayton A. Douglass, and F. F. Charles, Executive Committee. Henry L. Tolman, Treasurer. Charles Gentilé, 229 State Street, Secretary.

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AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Photographic Society of Philadelphia.—Established 1862. Meetings held at 31 South Fifteenth Street, on first Wednesday of each month. Annual Meeting, first Wednesday in January. Frederic Graff, President. John G. Bullock, Joseph H. Burroughs, Vice-Presidents. Galloway C. Morris, Charles R. Pancoast, John G. Bullock, Executive Committee. S. Fisher Corlies, Treasurer. Robert S. Redfield 1601 Callowhill Street, Secretary.

Rochester Photographic Association.—Meets on the first and third Monday of each month, at Eight o'clock. Election of Officers, first Meetings in May and November. S. D. Wardlaw, President. S. Miller, Vice-President. Fred. Stone, George Bacon, and Willis Bannister, Finance Committee. Frank Knapp and W. J. Lee, Executive Committee. J. M. Fox, Treasurer. W. H. Learned, Secretary.

Society of Amateur Photographers of New York.—Established 1884. All Meetings held at Society's Headquarters, 122 West Thirty-sixth Street, New York. Regular Meetings held on second Tuesday and Special Meetings on Fourth Wednesday of each month, except during July and August. Directors' Meetings are held on the Third Wednesday of each month. F. C. Beach, 361 Broadway, N.Y., President. Dr. John H. Janeway, Governor's Island, N.Y. Harbour, Vice-President. F. C. Beach, Dr. John H. Janeway, Henry V. Parsell, John T. Granger, C. W. Dean, C. Volney King, Allen S. Apgar, Robert Baker, Dexter H. Walker, John J. Wilson, Frank G. Du Bois, Board of Directors. Henry V. Parsell, 31 East Twenty-first Street, N.Y., Treasurer. John T. Granger, 1 Broadway, N.Y., Corresponding Secretary. Casper W. Dean, 32 Liberty Street, N.Y., Recording Secretary.

St. Louis Association of Amateur Photographers.—Established October, 1885. Robert E. M. Bain, President. Rev. C. M. Charropin, S.J. Vice-President. J. Withnell Dunn, Dr. C. H. Goodman, H. B. Alexander, with the President as ex-officio Member and Chairman, Executive Committee. W. W. Withnell, Treasurer. James A. Sherrard, Eighth and Locust Streets, St. Louis, Mo. Secretary.

St. Louis Photographic Association.—Meetings are held as business demands; generally one every two months, at G. Cramer's Photographic Gallery, 1001 South Broadway. Gustav Cramer, President. J. A. Fischer, Treasurer. R. Benecke, care of G. Cramer, Dry Plate Works, St. Louis, Mo., Secretary.

The Pioneer Amateur Photographic Club of Brooklyn.—Meets at Eight o'clock, South Oxford Street, Brooklyn, on the first Monday in each month from November to July. Lewis Atkinson, President, Edward Moran, Geo. W. Street, and Gilbert A. Robertson, Committee on Admissions. Dr. Skidmore Hendrickson, 636 St. Mark's Avenue, Brooklyn, Secretary.

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CONTINENTAL PHOTOGRAPHIC SOCIETIES.

Association Belge de Photographie.—Established 1873. Dr. Candèze, President. Baron R. de Sélys-Longchamps and A. de Blochouse, Vice-Presidents. H. Colard, J. de Neck, Florenville, O. Campo, A. Géruzet, O. Lamarche, L. Rommelaere, and R. Storms, Committee. Captain Massaux, Treasurer. A. Rutot, 31 Rue du Chemin de fer, Brussels, Secretary. Local de la Société: Eaverne du Dôme, Passage du Commerce, Brussels.

Liège Section.—Established May 17, 1874. Dr. E. Candeze, President. O. Lamarche, Vice-President. H. Colard, J. Deneck, Florenville, A. Géruzet, O. Lamarche, L. Rommelaere, and R. Storms, Committee. Lieut. Massaux, Brussels, Treasurer. Capt. Léon Davreux, 12 Rue Bassenge, Liège, Secretary.

Dansk Fotografisk Forening.—Established 1878. J. Petersen, President. Chr. Neuhaus, Vice-President. Hilmar Crone, Johannes Petersen, and C. F. L. Galle, Committee. Chr. Neuhaus, Treasurer. C. F. L. Galle, Gothersgade, 15 Kjöbenhavn K., Secretary. The Meetings are held the last Monday in September to April, at Eight o'clock, by Wittmack and Rüse, Holmens Canal 17.

Deutscher Photographen Verein.—Established 1876. K. Schwier, Weimar, President. Fr. Müller, München, Vice-President. Conr. Kindermann, Hamburg, and Georg Brokesch, Leipzig, Committee. Karl F. Wunder, Hanover, Treasurer. Fr. Tellgmann, Mühlhausen in Thüringen, Secretary. Address of the Society: K. Schwier, Weimar. Die Wanderversammlungen der D. Ph. V. finden jährlich 1 mal in August statt; in Jahre 1886 in Stuttgart.

Internationaler Photographen Verein, 'Victoria.'—Established 1882. H. Dieterich, Guben, President. A. Schulz, Königswalde, Vice-President. Th. Weiss, Guben, E. Berger, Grünberg, R. Ochs, Frankfort-on-Oder, H. Wegener, Freienwalde, Committee. Carl Grall, Guben, Treasurer and Secretary.

La Société Versaillaise de Photographie.

Münchener Photographische Gesellschaft.—Established 1879. Franz Werner, President. Otto Perutz, Treasurer. Paul Zschokke, Landwehrstrasse, 31, München, Secretary.

Photographische Gesellschaft, Hamburg, Altona.—Established November 4th, 1873. G. Wolf, Hamburg, President. Th. Petersen, St. Pauli, Vice-President. Herm. Boock, C. W. Lüders, Kunstschleifer, Committee. W. Köhnen, Altona, Treasurer. H. Boock, Bergstrasse, 26. Meets first Tuesday in the month, at 8 p.m., at Gerhafstrasse, 10, Hamburg.

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CONTINENTAL PHOTOGRAPHIC SOCIETIES—*Continued.*

PHOTOGRAPHISCHE GESELLSCHAFT IN WIEN.—Established 1861. Ottomar Volkmer, k.k. Regierungsrath, President. Achilles Melingo, Ritter von Saginth, Vice-President. Victor Angerer, Franz Antoine, Dr. T. M. Eder, Carl Haak, Oscar Kramer, Josef Löwy, A. von Melingo, Dr. W. Freiherr von Schwarz Lenborn, Dr. Josef Szekely, and Hauptmann Victor Toth, Committee. Ludwig Schrank, Redacteur der Vereinszeitschrift, Treasurer. Professor Fritz Luckhardt, Bureau der Gesellschaft, III. Hauptstrasse, 9.

PHOTOGRAPHISCHER VEREIN ZU BERLIN.—Established 1863. Dr. Fr. Stolze, President. Dr. F. Stinde and Carl Suck, Vice-Presidents. Paul Grundner, F. Funk, C. Georgi, C. Brasch, and G. Braun, Committee. F. Schüler, F. Funk, Paul Grundner, Albert Schwartz, and Carl Suck, Technical Examination Commission. E. Martini, Treasurer. Albert Schwartz, Luisenstrasse, 23, Berlin, N.W. Meetings on the first and third Thursday in the month, at Kaiserhallen u. den Linden, 27.

SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE, Rue Louis-le-Grand, 20, Paris.—M. Peligot (de l'Institut), President. A. Davanne (President), Aimé Girard and Ch. Bardy (Vice-Presidents), Perrot de Chaumeux (General Secretary), A. Audra (Treasurer), E. Becquerel (de l'Institut), Al. Chardon, A. Civiale, Ferrier, Gauthier-Villars, Gobert, Adolphe Martin, S. Pector, Roger, and De Villecholle, Committee. H. Bayard, Honorary General Secretary. Bordet, Librarian. V. Prevel, 20 Rue Louis-le-Grand, Paris, Secretary-agent.

SOCIÉTÉ NANTAISE DE PHOTOGRAPHIE.—Established 1881. M. Alfred Bascher, President. M. du Hanlay, Vice-President. The whole of the Council and MM. Toublanc, Bruneau, and Donault, Committee. M. Tassain, Treasurer. M. Paul Crémant, 13 Rue d'Alger, Nantes, Secretary. Committee Meeting the last Friday in the month, and General Meeting the first Friday in the month, at Le Cercle des Beaux-Arts, Rue Voltaire, Nantes.

SOCIETY FOR THE ENCOURAGEMENT OF PHOTOGRAPHY AND THE ALLIED ARTS, FRANKFORT-ON-MAINE.—H. P. Hartmann, President. F. W. Geldmacher, Vice-President. C. Reutlinger and T. Schmidt, Frankfort-on-Maine, W. Pöllot, Darmstadt, and C. König, Mannheim, Committee. C. Böttchen, Treasurer. H. Lüer, Librarian. G. Albers and T. Bamberger, Auditors. E. Rheinstädter, Court Photographer, Frankfort-on-Maine, Secretary. Th. Haake, Merchant, Frankfort-on-Maine, Assistant Secretary. Place of Meeting, Hall of the Winter Garden. Scientific Meeting, the first Monday in each month. Letters, &c., should be addressed to Herr H. P. Hartmann, 1ter Vorsitzender des Vereins zur Pflege der Photographie und verwandter Künste, Frankfort-on-Maine.

VEREIN BERLINER PHOTOGRAPHEN GEHILFEN.—Established March 1st, 1876. Paul Meyer, Treskow Strasse, 37, President. H. Aschenbrenner, Treasurer. Paul Meyer, Treskow Strasse, 37. Meets every Thursday at 8.30 p.m.

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'ILFORD' DRY PLATES.

SUMMARY.

If there is anything in the practice of photography that can be said to have acquired special prominence during the past year it is the popularising of the fine black tones peculiar to the platinotype and the increasingly popular mode of printing upon gelatino-bromide of silver paper. This latter has, indeed, achieved a high degree of favour among photographers, not alone from the rich character of its black tones, but also from the ease with which it lends itself to the production of prints by artificial light, and especially to enlargements. This in turn has created a demand for enlarging lanterns, in which a brisk trade is being created.

Orthochromatic photography has also advanced to a high state of perfection, its latest development consisting in an application of certain preparations to commercial gelatine plates, by which they are rendered in a fit state to copy a painting so as to give the various colours in their true values in light and shade, and without impairing their sensitiveness.

Local photographic societies are still increasing both in numbers, in strength of members, and in efficiency.

But the great event of the year in this connexion has been the formation of a national society—'The Photographic Convention of the United Kingdom,' which is formed somewhat on the basis of the British Association for the Advancement of Science, intended, like it, to be nomadic as regards its place of congress, and the time of its annual meeting—one week—being selected when the societies are in summer recess, and the place one which will afford practical work being done with the camera. Its inaugural meeting was held in Derby, Glasgow having been selected as that for the year before us.

The subject of flexible supports for negatives has received much attention at the hands of those manufacturers who make a feature of such preparations. While it is not supposed that gelatino-bromide paper will ever supersede the employment of glass plates for portrait work in the studio, especially for 12 × 10 plates and under, there is no doubt of there being a healthy future before it for landscape work, and more particularly for the requirements of the tourist. It will be welcome intelligence to this class to know that towards the close of 1886 the subject of stripping films, hitherto in an experimental or tentative stage, has been brought to that further stage of being a commercial fact, as the gelatine pellicle in which the negative is contained can now with certainty and ease be removed from the paper upon which it was exposed, developed, and fixed.

This suggests the subject of roll holders and dark slides specially constructed for using with paper instead of glass. These now exist in a state of great perfection, as will be seen from some account of them in another page.

A great decrease in the price of magnesium has taken place. There is every reason for believing that the employment of this metal for artificial illumination for portraiture, especially during the dark months of the year, will eventually be much resorted to. By its use the problem of an easy and cheap method of taking portraits either during foggy weather or as a parlour pastime at night is completely solved.

Nothing new or startling has occurred in the optics of photography, although some makers of lenses have, in single objectives, and also those of the 'rapid' class, somewhat increased their maximum working apertures, thus imparting to them some of those properties specially possessed by portrait lenses.

Collodio-bromide is keeping well to the front as a means of making lantern slides. The great ease with which this process can be worked, as well as the exceptional excellence of the results obtained by it, will ensure its increased popularity.

Among the deaths that have occurred during the year we have to record those of Dr. Hugh W. Diamond, of Twickenham, who passed away at a ripe old age; Mr. Albert Sachs, of Bradford; and Mr. Silvester Laroche, of Birmingham. Dr. Diamond rendered great services to photography at the time of the introduction of the collodion process, while Mr. Laroche was made the defendant in a lawsuit to determine whether Fox Talbot's patent should not cover the use of collodion and pyrogallic acid.

STEREOSCOPIC PHOTOGRAPHY.

By The Editor.

Prefatory.

While all unite in expressing their admiration for the stereoscope and their sorrow at its decadence, such is the whimsicality of public opinion that, in consequence, perhaps, of a remark dropped from some one in high social position, this system of photography may suddenly be more eagerly rushed after than it was even in its palmiest days. It has so much to recommend it over other methods that it is truly surprising how it has been allowed to fall into a state of desuetude. It is in the hope that the following brief disquisition may be the means of inducing young photographers to bestow attention upon this neglected branch of photography that it is written.

Chapter I.—The Stereoscopic Angle.

It is not considered desirable here to enter at length into the subject of the eye or the laws of vision, whether monocular or binocular. It will be enough at this stage to say that stereoscopeity, or seeing solid (from the Greek *stereos*, solid, and *scopeo*, I view), is only possible when both eyes are employed in observing an object. Each eye sees an object from a different point of sight as compared with its fellow. For example, examine with *both* eyes the scene outside of the window, or the opposite wall of the room in which you sit, and then hold up a finger at arm's length so as to intercept a portion of the view, keeping the eyes still fixed upon the distance, and you are conscious of the finger being in duplicate. Analyse this phenomenon by closing each eye in succession, and it will be found that in one case the finger falls upon a totally different part of the scene viewed from what it does in the other, and you realise that if the scene were depicted by the camera in two pictures as seen by each eye respectively, they would prove to be dissimilar representations of the same view.

What occurs in the example with the finger here adduced takes place in everything visible in nature, whether it be a row of trees, a distant mountain range, with rocks, trees, or other objects nearer to the point of observation, or even in a human figure situated a few feet from such point.

The sensation of relief or solidity is produced by the varying convergences of the axes of the eyes experienced in looking at an object. Let *a b* (Fig. 1) represent the distance of the eyes apart, and which we may term the parallactic base of a triangle (for binocular vision throughout is really a matter of parallax), the point *c* representing an object situated any moderate distance from the eyes and *d* an object much farther away. It is evident that the convergence of the optic axes must be much greater in the case of *a c b* than in that of *a d b*, and it is this greater or less degree of convergence that gives the sensation of distance. In Fig. 2 this is shown more plainly, the eyes themselves being directed to the points A B C D, all at different distances, and causing varying degrees of convergence of the optic axes.

This sensation cannot be appreciated when only one eye is employed in looking at an object, because of the impossibility of forming a parallactic angle, the area of the pupil of the eye, even if distended to the utmost by such applications as that of belladona, being altogether inadequate to produce parallax. Every reader will here recognise an application of this principle in the parlour pastime of bandaging one eye of a person, placing a pair of snuffers in his hand, and requiring him to quickly snuff a candle brought into the room, the probability being that he may miss it by several inches. The bearing of all this upon the taking of binocular or stereoscopic photographs will be seen as we proceed.

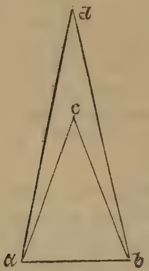


Fig. 1.

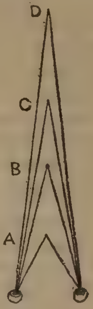


Fig. 2.

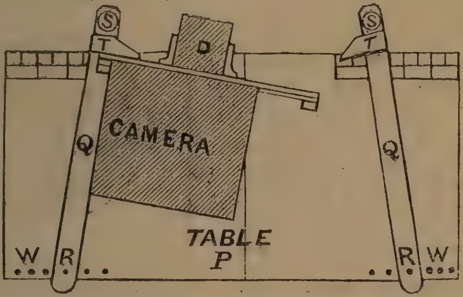
Chapter II.—Stereoscopic Photography with a Single Camera.

It may surprise some to learn that there is no camera by which stereoscopic pictures cannot be taken, not even excluding the little pocket quarter-plate instrument having only one lens. This, at the outstart, will prove a consolation to those whose appliances are limited. But for scenes in which there is motion, or for anything demanding simultaneity of exposure, a binocular camera is indispensable.

There are many subjects which demand a base line of the parallactic angle so great as to render the employment of a single-lens camera absolutely necessary, those, for example, in which the scene to be depicted in relief are at such a distance as to produce no effect of solidity when viewed even with both eyes from the point of sight, and the more distant the subject the greater must be the separation of such points of observation in order to secure the effect aimed at. To get a correct idea in the stereoscope of certain headlands and bays on a coast along which I was once sailing at some distance out at sea, and which coast appeared to the eye to be an almost even line, I have pointed the camera coastwards and taken a view, and then allowed the boat to proceed from one to several hundred yards before making my second exposure on the subject. This lengthening of the base line of the angle of observation enabled me to see in the resulting stereoscopic picture every projection and indentation in the coast, a result which could not have been secured in any other way. Of course under such circumstances all foreground effects must be sacrificed. Stereoscopic views of the moon must be taken on the same principle, or at the extremes of the librations, the angle representing a base line of thousands of miles.

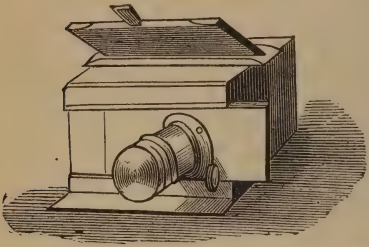
Any subject involving still life may be taken by a single camera. To do so in the most convenient manner it is only necessary to erect on the top of the camera stand an oblong table of wood about twelve inches long and of a width sufficient to act as a solid basis for the camera, which is supposed to be a somewhat small one. At each end of this table is fixed a ledge or strip of wood against which the side of the camera is placed. To operate, the camera is pushed first against one of these end checks and an exposure given ; a fresh plate is then inserted in the camera, which is then pushed against the check piece on the opposite end of the baseboard and a second exposure made. When the negatives thus obtained are printed from, the resulting picture will be truly stereoscopic. For flowers and other objects near at hand, the stereoscopic effect might be too great or exaggerated to be pleasing, hence it is desirable that one or both of the check pieces be made movable, so as not merely to permit them to be brought nearer to each other, but also to enable them to be placed in a slightly convergent position, by which the axis of the lens and camera may be pointed directly to the near object that is being photographed. Portraits, and even groups, may be taken in the most perfect manner by a single camera manipulated in the manner indicated, the only precaution necessary being the enjoining on the sitters the necessity for immobility throughout the double exposure and the insertion of the fresh plate.

One of the most perfect tables to erect on the top of a camera stand is that figured below.

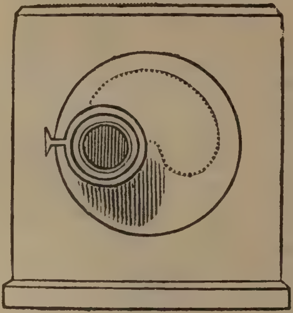


On the table, P, are two laths, Q, with pivotting arrangements at W R for effecting any degree of separation desirable. The convergence of the camera towards the near object to be photographed is regulated by thumbscrews at S, after which the camera is pressed alternately against the check pieces T. The lens, D, is shown as being at one side of the camera, which in this particular instance is fitted with a front which slides from side to side, so as to make a negative which will not require to be cut, but will at once yield prints having a stereoscopic instead of a pseudoscopic effect.

There are few photographers who do not possess a variety of lenses of different foci capable of being screwed into one flange. This is really almost a matter of necessity with those who, from any given standpoint, desire to be master of the pictorial situation. Now, as it may be inexpedient, on the score of expense or otherwise, to have these lenses duplicated for stereoscopic work, all difficulty may be overcome by having a front to the stereoscopic camera which is capable of being slidden in a lateral direction. There must, of course, be a division or partition in the camera. Should the subject be one that is best depicted as a single view covering the entire plate, the partition is withdrawn during exposure; but if, on the other hand, the view be one better suited for the stereoscope, all that is necessary is to insert the division, slide the lens to one side, and expose, then, recapping the lens, push it to the other side and repeat the exposure.



An equally effective and, perhaps, a more elegant system of employing a single objective for binocular pictures, is to have an aperture, like that shown by the dotted lines in the accompanying diagram, cut in the camera front and cover it by a disc of wood to one side of which the lens is screwed. This disc rotates upon an axis in the centre. After taking one picture, a semi-rotation is given by which the lens is carried over to the opposite side. This system also lends itself to the taking of a view covering the whole plate by employing the lens when in the centre, the sliding front of the camera being depressed a little so as to bring the lens opposite the centre of the plate.



Stereoscopic Portraits by a Fixed Single-lens Camera.—It is pertinent to this department of the subject to describe a method of taking stereoscopic portraits in a studio, which I suggested and carried into practical effect many years ago. Place the sitter in a library chair, or any other chair, so arranged as to be capable of rotating on its base, and instruct him to keep his eyes fixed upon a certain point not too near the camera. Assuming that a camera is employed for taking two negatives on one plate, one exposure is given. The chair is then rotated so as to present to the camera a very slightly dissimilar view of the sitter, when the second exposure is made. There must be no pronounced pattern in the back-ground, for although the sitter varies his position in regard to the lens and consequently produces a stereoscopic portrait, yet is his relation to the background not altered.

Chapter III.—The Binocular Camera.

For securing those effects which lend a peculiar charm to stereoscopic photography, a binocular camera is necessary. It is a little difficult to say what are the best dimensions for such a camera, but in everyday practice any of those cameras in daily use, from half-plate to whole-plate, will answer the purpose almost equally well. I myself give the preference to an 8 × 5 camera, in which, however, I frequently use plates 7½ × 5. But I have a strong leaning to the former, because I then have two 5 × 4 pictures, this last being a size suited for almost any purpose. Being in itself one of the standard sizes, two independent plates may be inserted where the full-sized plate is not readily accessible, and on these can be taken pictures of dimensions suited for the album, for the lantern, for producing enlargements, or for the stereoscope. True, for the last named, they are a trifle too large, but this proves advantageous in enabling a selection to be made as to the precise portion of the subject best calculated for trimming with effect for the stereoscope. Again, a 10 × 8 plate can be readily subdivided by one cut of the diamond for adaptation to this size of dark slide. What is really necessary in a binocular camera in which negatives are to be taken for direct printing, is that it shall admit a plate not less than 6½ inches long by 3½ inches high, although these dimensions may be found to be inconveniently small.

Allusion has already been made to the facility with which a binocular camera lends itself to either a pair of views on the plate or a single picture its full size. In addition to these, two dissimilar views may be taken on the one plate, if such be found to be desirable. The most compact outfit for the front of a stereoscopic camera is to affix to it three lenses, these consisting of the stereoscopic pair and, between them, one of longer focus for covering the entire plate.

In a binocular camera it is not necessary that the dividing partition extend all the way to the front, but it is essential that it extend so far forward as to prevent any of the light through one lens from having access to the opposite compartment. This is ascertained by extending the camera to suit the focus, removing the ground-glass and uncapping the lenses, then applying the eye to the back corners of the camera. This will show whether the divisional partition is of sufficient length.

Chapter IV.—Lenses: Single Achromatic Lenses.

It may doubtless create some surprise at first sight if I assert that single, or distorting lenses, in contradistinction to compound ones giving perfect rectilineality of projection, are best adapted for stereoscopic cameras. But this surprise will cease when I explain that an absolutely rectilinear photograph becomes distorted when viewed through the eye-pieces of the stereoscope, and that such distortion increases in proportion to the strength or magnifying power of the eye-pieces, whence it follows that the modicum of distortion shown by a slight curving inward of vertical lines in the margin which are straight in nature is counterbalanced by the distortion in the opposite direction which is produced by the eye-pieces of the stereoscope, the result being that the picture is seen free from all distortion. It is only in extreme cases, however, that is, when lenses of very short focus are employed in either instance, that distortion will be present in such a degree as to be appreciated, and then only when the subject is an architectural one, the vertical lines of which are brought close to the margin of the plate when the instrument through which it is viewed effects a perfect cure. I am far from contending that combination or non-distorting lenses of the higher class are unsuited for stereoscopic work, but only that they are less perfectly adapted for it if the eye-pieces of the stereoscope are powerful.

Every possessor of either a half-plate or a whole-plate camera should carry an extra front having a pair of lenses screwed on at such a distance apart as to be directly opposite the centre of each half of the plate he uses, as he can then, according to the nature of the subject, either take one picture the full size of the plate or a pair of smaller views for the stereoscope.

It sometimes happens, and this altogether irrespective of what lenses are employed, that one gives a sharper image than its companion lens. For my camera I have several stereoscopic pairs of lenses by different makers, but in the screwing of the flanges on the various fronts I make a separate study of each. I first screw on both flanges and attach the lenses, then, focussing on a well-marked object, I examine each image with a powerful magnifier. If both are not equally sharp I ascertain if this cannot be brought about by transferring the one to the flange of the other, for the mechanical work on two lenses, even when sent out in pairs, is seldom so accurate as to be perfect, when, if there is still dissimilarity I insert a paper or cardboard washer under the flange of one of them, which never fails to make the two images identical. The lenses are then marked so that each one thereafter is screwed into its own flange.

It is of course implied here that the lenses are fixed in rigid mounts, and incapable of being amenable to the adjustment effected by rack and pinion or even a plain sliding mount.

Chapter V.—Combination Lenses.

When compound lenses are employed it is above all things necessary that they be absolutely identical in focus. Two lenses alike in style and of similar *alleged* focus may be obtained from the same maker, yet in which the real foci may differ. This is discovered by the pictures produced by each differing—it may be very slightly—in dimensions, one being larger than the other. This fault, which must not be allowed to pass unchecked, may be remedied in an easy manner. Recognising the fact that the focus of a combination lens is altered by varying the distance at which the elementary parts are separated from each other in the tube in which they are set, the following formula expresses the action and value of such distance :—

$$f = \frac{a \times b}{(a + b) - d},$$

in which f is the desired equivalent focus of the combination, a and b respectively the front and back lenses, and d the amount of separation. This in plain language means that the equivalent focus of any two lenses when combined may be ascertained by multiplying their foci together and dividing by their foci added together, after deducting therefrom the distance at which they are mounted apart. Or, to express it more tersely, divide the product of the front and back foci by the sum of the front and back, less the separation; the quotient is the focus of the combination.

From this it will be seen that the distance at which the two lenses are separated forms an important factor in the determination of accuracy when adjusting a pair of objectives to ensure the images of both being identical. To give an instance of the effect of separation on the focus, which the better to convey the lesson will be an extreme one: Take two plano-convex lenses, each twelve inches in focus, and mount them flat sides together in contact; the focus of such an objective will be six inches. But separate them by little and little at a time and the focus will increase in length, shown by the image on the ground-glass becoming larger with each alteration. Continue this separation until it reaches ten inches, when it will be found that the objective has now attained a focus of about ten and a quarter inches.

The practical application of this to the case before us (that of a pair of portrait lenses not absolutely alike in focus) is, that by taking the lens which gives the smaller image of the two and unscrewing one of the cells—whether front or back is quite immaterial—one or more turns, such a lengthening of the focus will result as to bring the dimensions of its image up to those of the other.

The worst objectives of all for landscapes are portrait lenses employed with a stop in the middle. For portraits or groups in a studio they are invaluable, and they even answer for outdoor purposes when employed without a diaphragm, serving to secure transcripts of extremely rapid motion, but when a stop is inserted in such a case as a bright sky forming a part of the picture, then will there almost inevitably be a flare spot in the centre of the picture. Some of the 'rapid' class of cemented compound lenses now so much in use are not quite free from this fault. In their case a cure can be effected by setting the lenses a little closer together in the mount, or by separating them. The amount required to effect this cure is so very small as not to interfere with the—probably—otherwise excellent correction of the lens by its maker, who sometimes may not attach sufficient importance to the possibility of a flare spot being formed under certain conditions of lighting.

CHAPTER VI.—CERTAIN DEFECTS IN BINOCULAR PORTRAITS.

To get the eyes of a sitter in a photograph to look straight into those of the observer is simple enough when a single picture alone is in question. It merely suffices that he or she look straight into the lens while being taken. But it is different with binocular photography, especially when, in order to obtain the bust only, the camera is brought tolerably close up to the sitter.

It is almost invariably the case that under these circumstances the sitter will fix his eyes upon *one* of the pair of lenses in the camera, and in the print from a negative thus taken only one of the portraits will fulfil the desired condition; *it* will represent the sitter's eyes as looking intently towards the spectator, while its companion picture will show a deficiency in this respect. The rationale of this is obvious: while the axes of both eyes correspond with that of any one—say the right hand—lens upon which the eyes are fixed, both eyes, from the points of sight of the left-hand lens, are looking in a different direction to the extent of two, three, or four degrees, according to the proximity of the camera and the distance at which the lenses are mounted apart. Hence when the right-hand portrait is correct its companion picture is incorrect. If the difference were 'split' and the eyes directed to a point midway between both lenses, the defect would be mitigated but not remedied. While neither of the portraits would be absolutely correct, neither of them would be far wrong —a residuum of error still remaining.

Absolute accuracy in this matter can only be secured by the eyes of the sitter being directed straight towards the lens, and as this condition cannot be when there is more than one lens acting simultaneously, the inference is obvious—the old method exclusively adopted before the twin-lens cameras were introduced must be reverted to, namely, one picture must be taken at a time, and the eyes of the sitter, without any motion of the head or body being permitted, must be intently directed towards the lens on both occasions. This is the condition to be fulfilled if a perfect portrait possessing this characteristic be desired.

It may be objected to this method that the sitter is compelled to remain motionless for double the period required when taking a portrait in the usual manner. This is quite true; but when it is borne in mind that such portraits are taken with short focus and quick acting lenses, it will be perceived that the duration of the double exposure does not exceed that required for obtaining a *carte* portrait in the ordinary way.

To determine the real practical value of the method here suggested, I have taken a number of portraits with a pair of portrait lenses of short focus mounted three and three-quarter inches apart from centre to centre, and bringing the camera so close to the figure as to obtain a bust of the sitter. In these the difference is so marked that any one can immediately distinguish between portraits taken simultaneously when the eyes were directed towards only one of the camera lenses, and those taken consecutively when the eyes have been directed towards each lens in succession. In these experiments one lens was capped while the other was being used, and *vice versâ*.

CHAPTER VII.—PREPARING THE NEGATIVE FOR WHOLESALE PRINTING.

The negative having been obtained, the first question to be decided is the use to which it is intended to be put, by which I mean—Is it to be employed in the production of prints by the hundred or thousand to supply the market? or, Is it to be used for producing only a limited number of paper prints with an increased facility for employment in making transparencies? I shall treat both methods in detail, commencing with the former.

The selection of the precise portion of a binocular print that is to be cut out and mounted, and the trimming of each half so as to produce the best effect, entails a good deal of labour to the trimmer and mounter, which must necessarily add to the cost of production and subsequently of price. Some years ago, when in Savannah, I visited the gallery of Pierre Havens there, and observing that his stereoscopic prints consisted of one piece of paper and that the union of the two subjects was very neatly effected in the centre, although I knew that his camera being a binocular one the respective positions had necessarily been reversed in the negative, I was afforded an opportunity of witnessing the preparation of the negative, which consisted in cutting it in two according to a certain system and then transposing the parts thus severed. I made at the time the following notes, which cannot fail to be useful to those who either work on paper on a large scale or who desire to print transparencies by contact instead of by a regular transparency camera. Let it be presumed that although the dimensions of the negative are 8 × 5, the system answers equally well for plates of any other dimensions.

Draw a horizontal line upon a large sheet of paper, and upon this erect two lines three and a half inches apart. Now lay the negative face down upon the paper and, placing the half to the left upon the space enclosed between the two lines, see that the precise portion of the picture desired to be seen is embraced between these lines. Next, with a diamond and a rule, cut off the end at the left-hand mark, and then push the negative to the left until the corresponding portion of the other half is brought within the lines. Now cut off the end that projects beyond the right-hand line and, severing the two halves in the centre, reverse their positions so as to bring their opposite ends together. Lay these halves down on a plain 8 × 5 plate and bind all together with slips of gummed paper round the margin. The negative is now ready for being printed from.

To trim the prints, provide a glass-cutting guide, 6½ × 3½ inches, with an opaque line across the centre. Lay this down upon the print in such a way that the opaque mark shall precisely cover the divisional line which shows the junction of the two pictures, and run the trimming knife around the edge. The picture thus trimmed is now ready for being mounted on a stereo card, and it will be found to combine in the most perfect manner in the stereoscope.

To employ the negative thus prepared for printing transparencies by contact, it is only requisite that a mask be cut out in thin black paper, using the trimming glass just mentioned as the guide. This mask is laid down evenly upon the negative and kept in its place by gummed slips of paper. This is placed in the printing frame, and if the sensitive glass plate is laid face down upon this, a thin strip of wood having previously been placed at one end and one side to facilitate the laying down of the plate and ensure its correct position, the transparency which results will have a clean margin, the picture having sharp-cut edges.

It is not necessary that these dimensions be adhered to, in fact, it will prove advantageous if by reducing the width of each picture their centres or corresponding parts be brought nearer together. The pictures combine more readily in the stereoscope and give less fatigue to the eye when the amount of separation of the components of each picture in under rather than over three inches. Two and three-quarter inches will, in most cases, prove an adequate degree of separation; but more on this subject will be found in another chapter.

Chapter VIII.—The Snowy Appearance of Stereographs.

To what cause are we to attribute the decadence of the stereoscope? There are doubtless several, but I claim that one of the most potent of such is to be found in the character of the pictures issued in connexion therewith. Not the moral aspects of the slide, nor in this connexion their composition or selection from an art point of view, but that quality which in nine out of ten instances causes the spectator to remark upon the 'snowy' appearance of a picture taken even in mid-summer. In a single or monocular photograph, a bit of white may be allowed to pervade the vegetation, not only without a bad effect but frequently with a good one being obtained; but in a binocular picture no such liberty can be taken, else will the snow effect be produced as an invariable concomitant. It is therefore of the utmost importance that the light must not be allowed to be reflected from the slated roof of a house or from the leaves of trees (which are the chief sinners in stereoscopic slides) in such a way as to ensure opacity without detail in the negative. There is no objection to a little sparkle occasionally in a monocular picture, but it must be avoided in one for binocular examination, especially in trees, roofs, roadways, or pavements. Fortunately gelatine dry plates prove much superior to wet collodion in this respect, and their greater sensitiveness will ensure such an exposure being given as will prevent that patchy hardness in the negative which arises from insufficient exposure. When a generous exposure has been given and the development is not carried an undue length, then will there be little fear of snowiness in the whites.

When a negative is so intense as not to print through in the high lights without hopelessly ruining the half tones and shadows, it is frequently a good plan to first print an impression properly, and then, after removal from the frame, to degrade the high lights—especially vegetation which would produce a snowy effect—by a supplementary exposure to open daylight without the negative. Good effects may thus be obtained from hard and patchy negatives which, if printed from in the usual way, would yield proofs of the class here complained of. Many exquisite binocular pictures are flat, miserable looking things if viewed without a stereoscope, whereas, by the aid of this instrument they reveal themselves in all their soft beauty.

Chapter IX.—Trimming and Mounting Stereographs.

Of all the sins which can be laid at the door of the stereoscopic photographer, the greatest and most prevalent is that of bad mounting. If one hundred slides be taken indiscriminately from a large stock by various photographers, it is tolerably safe to assume that not more than twenty of them will be perfect in this respect. In some, the two halves are mounted too far apart; in others, each half has a different base line, the subjects not being on the same horizontal plane.

But the special defect by which the greatest number is characterised is the method in which the sides are trimmed. A properly cut and mounted stereograph should appear as if projected beyond the mount, which should serve the purpose of an aperture or window through which the view of external nature is seen. Owing either to the principle on which binocular prints should be mounted not being known, or, if known, to carelessness or inability to carry it into effect by those intrusted with the work, the anomaly frequently presents itself that the subject, instead of being viewed, as it were, through a frame or an aperture in the mount, actually stands up in relief in front of the aperture through which they are supposed to be seen.

Stand a few feet away from a window and look at the scene outside. You instinctively know that such scene is beyond the window. This arises from the right eye seeing a little more of the scenery on the left of the observer than does the other eye, the same taking place in the case of the left eye. Unless a binocular picture is trimmed and mounted in accordance with this principle, it cannot possibly appear natural when viewed in the stereoscope.

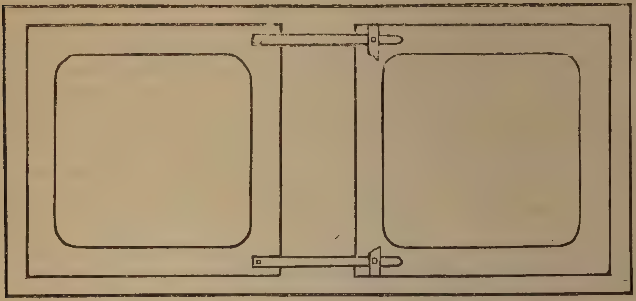
In giving directions for cutting stereoscopic prints so as to fulfil every requirement of perfection of principle and beauty of result, I shall first assume that the lenses have been screwed properly on the camera front—that is, one of them not being on a higher level than another—and, secondly, that the camera was placed level when the negative was taken. The first step consists in forming a perfectly straight and horizontal base line, which is done by selecting a point in the immediate foreground of one half of the print and where it is intended to cut it, such as a stone, a leaf, the point of a rock, or any similar distinctive feature, and having picked out the corresponding point in the other half, lay a straight-edge accurately against the two and pass the cutter along the whole edge of the double print. If the glass shape be then laid down, so that its bottom edge correspond with the newly cut edge, both pictures will be in exactly the same plane. Now place the shape upon the left-hand picture and cut it out.

It is in the trimming of the second or right-hand picture that skill is required. As their positions are to be relatively reversed on the mount, it will be requisite that a small portion more of the image be left at the right-hand side of the picture, now to be cut, than what appears in the other; and as both halves are equal in breadth, it follows that there will be less of the image on the left-hand side of this print than on the one which was cut previously. In doing this it is the foreground alone that must be taken into consideration; the distance must be quite ignored in determining the margins of the pictures, for if both halves were trimmed to agree as regards the distance, and the pictures were then mounted and examined, it would be found that the distance was on precisely the same plane as the mount, instead of being seen *at* a distance through the imaginary opening in the mount, while the middle and near objects would present the anomaly of being much nearer to the spectator than the aperture through which he is inspecting them.

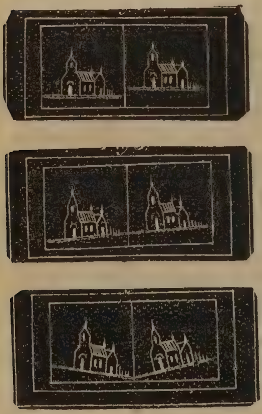
The tyro in stereoscopic photography may not be aware that, if measured by a pair of compasses, the distance between similar objects in the foreground of a mounted stereograph is less than that between like objects in the distance. Hence, if it were desired to print clouds and a moon in a stereoscopic view, the clouds would have to be farther separated than the distant objects in the scene, and the moons would have to be separated still more than the clouds, in order that their relative effects of distance be given.

When less of the left foreground on the left half of the pair is seen than there is in the right half, and *vice versâ*, then are the conditions perfect. In pasting the prints on the mount, a small portion, say a sixteenth of an inch, of the card should show between them, as this enhances the effect. To afford an idea of the want of care sometimes displayed, I find by measuring some slides made abroad by a photographer having a certain degree of eminence that, in order to trim them correctly, about five-eighths of an inch would have to be removed from each end, or from the exterior sides of both halves.

To facilitate the cutting of stereoscopic prints with accuracy and great rapidity, an apparatus was devised about ten years ago in the home of the writer, by which both halves can be perfectly trimmed by two strokes of the cutter. It consists of two thin metal mats, having apertures of the form and dimensions desired for the pictures. They are fastened side by side, yet so as to be capable of being adjusted and to stand any distance apart. The following diagram illustrates its nature.



The necessity for having an adjustment of this kind arises from this fact, that as only a small portion of the subject taken upon each half of a plate such as those now in general use can be utilised in the finished picture, it becomes a matter of importance that the portions that are used should be counterparts of each other. To adjust this compound mask, separate the centres of each to a distance corresponding to that which the lenses of the camera are separated, whatever that may be. A more accurate adjustment is then effected by placing the marks on an uncut print and adjusting the distance apart according to the principles already laid down. When once adjusted this distance will be found suited for every negative. When laid down upon an uncut print at random, so far as its position from right to left is concerned, the prints may then be cut out by two sweeps of the revolving 'trimmer' (which is a small wheel that rotates in a suitable handle) without the possibility of an error being committed.



Should the camera not have been properly levelled when taking the view, and one half stands a little higher than the other as regards horizontality on the negative, this can be easily rectified by easing the screws which bind the parallel bars and bringing one mask a little below the level of the other until both views coincide in the openings.

Even such abnormally placed subjects as those shown in the adjoining cut, can be trimmed with perfect facility by the piece of apparatus above described. They can also, of course, be trimmed by the plain guide and cutting-knife, but only at a greater expenditure of time.

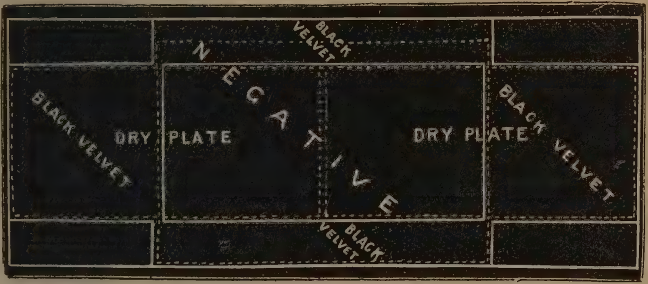
Concerning the distance at which one picture should be mounted apart from the other, I would once more reiterate what I have formerly said, that in order to strain the eyes as little as possible and to enable every one to see the stereoscopic effect readily, the centres of the component parts of a stereoscopic picture should by preference be two and three-quarter inches apart, but should never exceed three inches, and this when distant objects are considered. The height of the pictures is immaterial, as in a good stereoscope the eyes may have full play in a vertical direction. The nature and class of subject must in a great degree determine its height, a mountain ravine demanding greater scope vertically than a flock of sheep on a flat meadow.

Let it be understood that in speaking here of the amount of separation between the pictures, it refers exclusively to the prints when mounted, and has no reference to that of the lenses on the camera by which the negative was taken.

Chapter X.—Stereoscopic Transparencies.

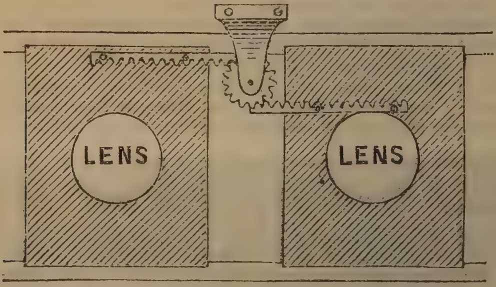
In a previous chapter I have described a way by which negatives may be cut and transposed, so as to be capable of printing a transparency by superposition and at one exposure. When a binocular negative is employed without its halves being transposed, it is necessary, in the case of contact printing, that the right-hand end of the negative be superposed upon the left end of the sensitive plate, and *vice versâ*.

The practical way of carrying this into effect is to have a board a little over one and a half times larger than the negative, having an aperture of suitable form in the middle, and guide pieces to permit of the negative being slidden to either end so as to bring each half alternately opposite to the aperture. Provision must be made by which the sensitive plate is moved in the opposite direction to that of the negative. The first exposure is then made, after which the negative is moved so as to bring the other half opposite the aperture, the sensitive plate being also moved in an opposite direction, when the second exposure is given.



The printing frame now to be described is so simple as to be easily constructed by any one. It is the outcome of the ingenuity of a contributor to The British Journal of Photography fifteen years ago. The centre recess in the sketch is seven and three-eighths inches wide by five and a quarter high, to admit a 7¼ × 4½ negative, the extra three-quarter inch allowing the plate to be raised or lowered to cut off sky or foreground, as required. When in position the face of the negative is rather higher than the two side recesses, in which one or two squares of velvet are laid till both are on the same level. Two dry plates of the ordinary stero. size are then laid upon the negative, and the frame closed. The back is in two pieces to allow for the varying thickness of the dry plates, and when closed the chief pressure is upon the exposed half of each plate. Previous to the second exposure the plates are made to change places, the result being two transparencies from the uncut negative.

But by far the best way by which to produce a stereoscopic transparency is through the agency of the copying camera. Assuming an uncut negative to be employed, it is not only indispensable that two lenses be attached to the camera, but that provision be made for varying the distance between them to suit the varying conditions under which each negative must be treated. This separation of the lenses may be effected either by a right and left threaded screw, or, as in my own copying camera, by the arrangement shown in the cut below.



A few inches of common brass rack, which may be procured from any dealer in camera requisites, are attached to the square wooden pieces that carry the lenses in such a way that they gear into a small wheel or pinion securely fixed to the camera front, one of the racks being above and the other below. By rotating the pinion by a brass milled-headed nut, not shown here, the lenses are made to travel in opposite directions. This mechanism is covered by a slab of mahogany which prevents it being seen in the finished camera front.

Almost any good lenses will serve for this transparency camera, but it is well that a small stop be employed. It is convenient, but not necessary, that a dark cover shall extend between the frame containing the negative and the lenses. In a transparency camera of the best class, the negative should be held in a frame capable of both vertical and lateral motion, and a bellows body should extend from the negative frame to that which holds the lenses, and of course from the latter to the sensitive plate. It is well that opaque paper mats, having openings of similar size and shape, be fixed by indiarubber paste upon the back of each half of the negative. I prefer this paste because it permits the masks to be easily adjusted, as it does not become dry. It is also best that, by means of rods projecting at the back of the camera, all the adjustments can be made while the eyes are on the ground-glass focussing screen. By adjusting the distance between the two copying lenses it is quite easy to get the portions of the negative that are to be printed brought into correct position on the ground-glass.

A camera of this class is capable not only of copying an image the same size as in the negative, but it can be rendered effective in enlarging two small corresponding portions, even if only an inch square, up to the full stereoscopic size. When copying to the precise dimensions, as in the negative, the distance between lens and negative and between ground-glass and lens will be equal to twice the solar focus of the latter.

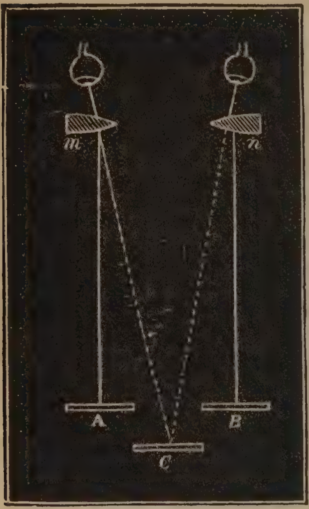
It is foreign to the scope of these brief chapters to speak of the processes of printing transparencies which may be employed. Some will use wet collodion, others, collodio-bromide, gelatine, albumen, or other dry plates. This I leave to individual taste. One thing, however, must be borne in mind, a thin image as regards opacity in the shadows is necessary, and yet a degree of density must be obtained exceeding that in a good transparency for the lantern. Warm brown tones are most pleasing.

Avoid backing a very fine transparency with ground-glass, as the granularity, when magnified by the eye-pieces of the stereoscope, will be offensive. Some kinds of flashed opal form a backing which does not stop much light and permits of the finest and most delicate details in the picture being easily seen. I incline to give preference to a piece of plain glass coated with an emulsion prepared with a rather thick collodion (say eight grains per ounce of solvents), containing in suspension very finely sifted carbonate of lead, in the proportion of about as much as will lie on the blade of a penknife to the ounce. Should this prove to be too little, shown by a too transparent film, add more until the desired effect is obtained. Also add four drops of castor oil to impart toughness, and about a drachm of Canada balsam to ensure adhesion.

Chapter XI.—The Stereoscope.

On the subject of the stereoscope itself so much can be written that it were vain to attempt, in the limited space now at command, to render it justice. All, therefore, that can be done here will be to offer some desultory remarks on certain points connected with it.

The general optics of the popular refracting stereoscope is not difficult to understand. Its eye-pieces are composed of a pair of semi-lenses, or lenticular prisms, placed with the edges towards each other, as shown in the cut. Two pictures, A and B, having been placed side by side at the focus of these eye-pieces, the rays enter the eyes through the prismatic lenses, *m* and *n*. Between the pictures and the lenses the rays are parallel, or practically so, but owing to the refraction of the eye-pieces the rays diverge, the result being that the axes of the eyes converge and follow the direction of the dotted line to C, where the observer sees a single picture composed of the other two. Although the diagram is not drawn with any pretension to optical accuracy, it quite well serves the purpose now intended. Instead of semi-lenses as eye-pieces, whole lenses may be employed, although they must be mounted at such a distance apart as to enable the eyes to be opposite a point between the centre and the margin, the amount of separation in this case slightly exceeding the distance between the eyes. A pair of spectacle glasses, of eight inches focus, if mounted in accordance with these principles, will serve as eye-pieces for a stereoscope, which may yield as much pleasure as those of a more pretensious order.



But perfection in the stereoscopic examination of binocular pictures can only be obtained when the eye-pieces are achromatic, for with such the image is sharp throughout and free from those fringes of colour which attend upon the employment of single eye-pieces, more especially if they magnify much. As the result of careful examination of several stereoscopes in my possession, I unhesitatingly advise that the eye-pieces of an achromatic stereoscope have a diameter of one inch and three-quarters, and a focus not exceeding six inches. They must be mounted plane side next to the eye, and have their centres three inches apart; but on the subject of the separation of the eye-pieces it is imperative that, in order to suit all eyes and every class of picture, one possesses the power of increasing or diminishing this distance at will. The mechanical means for effecting such separation may either be a rack and pinion effective motion in opposite directions, as figured in Chapter X., or it may be a right and left hand threaded screw, or a lever which actuates both lenses; but whichever mechanical device be adopted, it should be such as to cause the wooden pieces which carry the lenses to respond at a touch. It is, of course, understood that these pieces slide easily and without sticking in grooves or other guides, laterally, in the eye-piece end of the stereoscope. This affords the means for the immediate uniting of pictures which, owing to their having been mounted too far apart, could not otherwise be got to coalesce in any ordinary stereoscope.

I attach much more importance to this adjustment of the eye-pieces than to the means employed for focussing the picture, which can be fairly well effected by ordinary sliding on the baseboard of the instrument, although, with a high power in the eye-pieces, the rack and pinion is both more elegant and more pleasant. Since commencing these chapters I have had a pair of achromatic eye-pieces constructed 1·7 inches diameter, with a focus of only five inches, and find in the greater degree of magnification produced an immense advantage over all others. With these the picture looks like a panorama, so great is the angle of delineation.

The form of each lens is nearly, but not quite, plano-convex; the flatter side being slightly convex. The definition is perfect up to the margin.

In all cases the eye-pieces should have a hood to prevent the light from the sides impinging upon the eye-pieces.

For viewing prints on paper there should be free access of light to it both from above and on either side. Some otherwise good forms of stereoscope, in which the old-fashioned original conical or even square box is discarded, are still provided with a partition extending from between the eye-pieces down along the base. This, in my opinion, is quite a mistake, for nothing whatever should interpose between the eye-pieces and the picture carrier. In the case of transparencies it is different; here there should be an opaque covering to prevent any light from impinging upon the picture, as it should be seen by transmitted light alone.

In these remarks I have had in view only binocular pictures of the average size and class. It is quite easy to examine those of large dimensions, even up to 12 × 12 each, and bring them into perfect coalition, but to do so necessitates the employment of reflecting stereoscopes such as that of Wheatstone (which is terribly bulky), or of a prismatic class, such as those of Mr. Grubb, the consideration of which, with others, would be foreign to the scope of the present article.

CHAPTER XII.—HOW TO SEE BINOCULAR PICTURES WITHOUT A STEREOSCOPE.

It is often very convenient to be able to take up a number of binocular pictures and see their true stereoscopic effect without employing an instrument. It is well known that many possess this power, which is exercised by a slight effort on the part of the eyes. The art of doing this may happily be acquired without much difficulty, and when once acquired it is never afterwards lost, and the best directions for its acquisition are those I gave under other circumstances.

The first attempt must be made by means of a diagram made by the experimentalist himself. Upon a sheet of plain white paper make two simple ink marks—dots or crosses—close to the upper margin about an inch apart. Upon another sheet of paper make any kind of ink mark, and hold it at a distance of eighteen or twenty inches from the eyes. Now hold the former paper in such a manner that it shall be about half-way between the eyes and the other paper, the marks referred to being at the top, and the position such as merely to allow the single mark to be seen and no more, in short, so that two marks on the one sheet and the one mark on the other shall be nearly in a line. Then look intently at the single or more distant mark, and while doing so the mind becomes conscious of the fact that there are three crosses or marks now visible upon the nearer paper which, by the way, may be moved in or out from the eyes till those conscious images coalesce. By a little effort the eyes can soon be diverted from the contemplation of the distant mark to the central one of the three which intervene, and which lies directly in the path of the distant mark.

When after a little practice this can be done easily, then make on another sheet two marks a little farther apart than those upon which the first attempt was made, increasing, if need be, the distance between the eyes and the single mark. After a few minutes spent in this mode of practice, such an amount of control will have been acquired over the muscles of the eyes that a binocular photograph may then be made to take the place of the double-image diagram. But this photograph should have strong leading characteristics, and, above all, its halves must be mounted nearer to each other than is usual. It will be better for the student to select a well-marked picture, containing a single tree or a spire, cut it through the middle, and make it overlap so as to bring its elementary parts closer together. Treat this picture as was done with the diagram; let it be held up at a distance of about eighteen inches against a sheet of paper, containing a mark which is more than twice this distance from the eyes. Direct the eyes, as before, toward the mark, and they will imperceptibly observe that there are three photographs intervening. Now without any effort let the eyes be insensibly directed toward the central one of the pictures, and the instant this is effected the picture stands out in all the relief of nature, being composed of both the original images.

When the foregoing effect has been obtained, the eyes will ever afterwards obey the will, and by diverging the axes slightly, or, to state it more correctly, by rendering them parallel, stereoscopic pictures may be seen in all their marvellous relief without an instrument. In the case of pictures which have been wrongly mounted, or are to be examined without being cut and their halves transposed, the converse of this is still more easily effected. The (reversed) pictures are held opposite the eyes at a distance of about eighteen inches, and an object of small dimensions, such as a pencil, interposed between the eyes and the picture in such a way and at such a distance that when the right eye is directed to the left picture it shall intercept it to some extent, doing the same thing when the right-hand picture is viewed by the left eye. In this position examine the pencil attentively, and the mind will realise the fact that there are three pictures in the background, the centre one of which may with little effort be made the subject of examination by the eyes, with stereoscopic effect as before. This method differs from the former, inasmuch as the axes of the eyes converge to such an extent as to cross between the eyes and the picture. No pain or peril to the organs of vision results from the proper examination of images in this manner, although, like everything else, the power is capable of being abused.

It need scarcely be observed, that if an untrimmed and untransposed binocular picture be viewed in the stereoscope, the effect will be pseudoscopic, the near objects being thrown in the distance, and the distant objects being brought quite near.

In conclusion, I wish it to be understood that this series of brief chapters are to be considered as suggestive rather than exhaustive of the subject of taking binocular pictures. As previously stated, the subject of the stereoscope itself as a mechanical and optical instrument has only been hinted at, as that department of the subject of binocular photography would, if fully treated on, require more space than could be afforded in these pages.

COLLODION EMULSION NOTES.

By W. B. Bolton.

As I notice there is at the present time a reaction in favour of collodion emulsion, at least for transparency purposes, I need, I hope, make no excuse for selecting this as the subject for an article in the Almanac, although Messrs. John Nesbit and J. B. B. Wellington have during the past few months briefly but ably treated the subject before two of the London societies.

I may premise that my remarks apply solely to *washed* collodion emulsion, which is as distinct in its character and requirements from collodio-bromide as it is possible for two things having a somewhat similar nature and name to be. The similarity between the two processes scarcely extends beyond the mixing of the emulsion, though there is a tendency abroad to speak of all collodion emulsions containing bromide of silver as 'collodio-bromide.' As a matter of fact, there are as many distinct *collodion* emulsion processes as there are gelatine; there are but two types—washed and unwashed—collodio-bromide belonging to the latter, though the former is the favourite, and my remarks will apply to all processes that come under that head.

The Pyroxyline.

An erroneous impression prevails that 'high temperature' pyroxyline is a *sine quâ non* in washed emulsion work. Not only is this not a fact, but unless the high temperature employed in the manufacture be counteracted by other means it is absolutely injurious. Thus if a temperature of 170° Fahr. be accompanied by a large proportion of sulphuric acid the product will be suitable, where with the same temperature and a lower proportion of that acid it would be quite unfit for washing, though it might give good results in an unwashed emulsion. I will not say that a *better* result is obtained with a low than with a high temperature cotton, but it has been proved that an equally good washed emulsion can be made *with less trouble* from a low temperature and somewhat tough sample than from the best high temperature preparation.

The fact is that ordinary photographic pyroxyline contains in varying proportions certain constituents which are soluble in water, especially when hot, and also in alcohol and other liquids. These soluble constituents appear to be increased as the 'organic' character of the pyroxyline becomes greater and its fibre more disintegrated, a result produced by raising the temperature of the acids and the proportion of the nitric. Sulphuric acid, on the contrary, toughens or 'parchmentises' the cellulose, and a preponderance of this acid, together with the less disintegrating action of a comparatively low temperature, say from 140° to 150°, will produce a tougher product which will better stand the washing operation, though, mayhap, inferior for the purpose of collodio-bromide to a high temperature cotton. The washing, in fact, removes certain portions of the pyroxyline, upon the retention of which, or of their silver compounds, the *quality* of the emulsion greatly depends.

On the other hand, washing tends to improve a tough and 'horny' pyroxyline, and to confer upon it properties it did not previously possess. Thus, such a sample of cotton in the wet process would produce thin images, not because it lacks 'organic' qualities, but because from its 'skinny' and impermeable character the film is not properly acted upon by the solutions. This impermeability is partially removed in the process of washing, or at any rate the physical character of the pyroxyline is changed.

This probably accounts for the somewhat anomalous fact that a sample of cotton which is unsuitable for washed emulsion purposes is almost invariably improved by a previous washing or precipitation. It would seem that a pyroxyline which will not bear a single washing is scarcely calculated to stand *two;* we can only imagine that the first washing removes all that is removable, just as passing a mixture of gravel and sand through a sieve clears the gravel of its sand once and for all. What is left after once washing the pyroxyline is, like the gravel, unaffected by a repetition of the process. Certain it is that an emulsion made from precipitated pyroxyline will not only bear washing in the ordinary manner after partially drying as well as the best high temperature or other cotton, but it will stand what few of the latter will, a second precipitation. The operation known as precipitation consists in pouring the collodion or emulsion in a thin stream into a large volume of water and stirring well to separate out the solvents.

Celloidine—a washed pyroxyline—is for the same reason admirably suited for this purpose, though extremely inconvenient to use on a small scale.

To those who choose to experiment in the manufacture of their own materials, it may be useful to know that papyroxiline is particularly well adapted for washed emulsion, as with a low temperature, weak acids, and a long immersion a product is obtained which is tough without being impermeable, and gives a film almost absolutely free from 'structure' or grain.

THE SOLVENTS.

Almost the only care that need be given in selecting the solvents is to see that they are of proper grade or sufficiently free from water. Presuming that they are obtained from a respectable house there need be little doubt as to the purity, so far at least as our purpose requires it, of either ether or alcohol, but the specific gravity must be carefully looked to. Methylated solvents are here referred to, as they are quite good enough for emulsion work if of good ordinary commercial quality. But owing to the ridiculous excise restrictions it is impossible to obtain methylated alcohol of more than a certain strength, though the specific gravity of the commercial article may be found to vary very considerably. I have met with it as low as s.g. ·812 and as high as ·840, but the former is, I should say, very rare, the average being from ·820 to ·826. Methylated ether, on the other hand, can be obtained of the highest strength, indeed, in one price list I have by me a highly rectified preparation from methylated alcohol is quoted of s.g. ·717, while the highest quality of the pure is s.g, ·720. For all practical photographic purposes the methylated ether is quite as pure as the other since the process of etherification removes any impurities which might exist in the methylated alcohol operated upon.

In selecting a sample of ether I should always recommend that of ·720 specific gravity in preference to either ·725 or ·730, the next two qualities ordinarily met with, as the difference in price is only a few pence per pound, and with the stronger sample of ether the grade of the alcohol is of less importance. For washed emulsion—that is, in the first stage, previous to washing—an alcohol no stronger than ordinary rectified spirit (s.g. ·838) may be employed if the ether be good, but it is better by far to have both solvents of the highest possible strength.

THE BROMIDES.

The choice of bromides is a matter of some importance, chiefly from the point of view of convenience. The only ones that exhibit any special features of recommendation are the salts of ammonium, cadmium, and zinc. The first is not sufficiently soluble in alcohol to be employed alone, especially in a highly salted collodion, while the second is equally unsuitable on account of the length of time it is needful to keep the collodion after bromising and before use. But by a judicious mixture of the two the faults of both are removed; the cadmium salt vastly increases the solubility of the ammonium, while the latter removes the necessity for keeping the collodion to ripen. In using the two salts a good plan is to mix them in quantity and form a double salt, by which means a definite compound free from water of crystallisation is obtained, and which is very soluble in alcohol and ether. To make the double salt, weigh out the quantities of the bromides of ammonium and of cadmium and mix them in a glass mortar or other suitable vessel. The latter salt contains four equivalents of water of crystallisation, which upon grinding or stirring the two together separates and converts the mixed crystals into a pasty mass or magma. When this condition is reached the mixture should be placed in a hot oven to drive off the water, and when thoroughly dry the mass may be broken up for use; or it may be fused in a porcelain capsule, care being taken not to apply too great a heat, which will volatilise some of the ammonium salt. This double salt is anhydrous, and if the constituents be mixed in the proportion of one equivalent of each, the combining equivalent as compared with silver nitrate (170) will be about 123, or if one of cadmium to two of ammonium be used the corresponding equivalent is theoretically 117. But these figures are liable to vary in different batches, so it is better to test each one separately.

Bromide of zinc is a favourite salt with many collodion workers on account of the richness and density of the film it gives, though for lantern work I prefer the greater translucency given by ammonium and cadmium. Besides, the zinc salt is very unstable and likely to lead to constant errors. It may be combined with ammonium or cadmium, in which case the compound is more stable, but I cannot myself see any adequate advantage.

MAKING THE COLLODION AND EMULSION.

I have intentionally connected the two operations, because in following one course of procedure there is great danger of failure. In making ordinary collodion it is a very common practice to dissolve the bromides and pyroxyline at one and the same time, and to let the collodion clear itself for use. This is all right, for whatever proportion or quantity of bromide and iodide the clear collodion may contain, the proper proportion of silver is duly extracted from the bath. But if the same plan be applied to emulsion collodion trouble commences at once. Take any formula; for instance:—Ten ounces of ether, five ounces of alcohol, two drachms of pyroxyline, and two hundred grains of bromide; five ounces of alcohol being kept in reserve for the purpose of dissolving the silver subsequently added. These ingredients are supposed to make fifteen ounces of collodion, *but they make more,* since the pyroxyline takes up *some* room; and if, therefore, small batches of emulsion be made up from this stock collodion, each ounce measured off will contain less bromide than the silver is calculated for. Even if the whole be made up, at the time of mixing, to a certain volume, evaporation will soon upset the accuracy of the bromising.

For these and other reasons, even when the pyroxyline is one that dissolves perfectly clear, I prefer to make a stock of *plain* collodion, keeping in reserve a definite proportion of alcohol for after purposes. Then, when a batch of emulsion is to be made, weigh out the quantity of bromide, and transfer it directly to the bottle in which the emulsion is to be made; measure in the quantity of plain collodion, and shake up until dissolved. Now whatever occurs in the way of evaporation or miscalculation of the exact quantity of collodion used, at any rate a definite quantity of bromide is there to meet the calculated quantity of silver. This may seem a small matter, but it has, within my own knowledge, been the rock on which many unsuccessful emulsion workers have split.

In adding the silver to the collodion, I see it has been recently recommended to dissolve it in a given quantity of alcohol. This is a troublesome and slow operation at best, but if it be first dissolved in a small quantity of water, and the alcohol then added, the process is greatly accelerated. Silver nitrate is soluble in less than half its weight of boiling water; if, then, half as many minims of water as there are grains of silver be poured upon the latter, a few seconds over a spirit lamp will cause the crystals to dissolve, and then, if the alcohol be added a little at a time and the solution reheated after each addition, or if previously heated in a separate flask the alcohol be added all at once, no precipitation of the silver will occur. Before commencing to add the silver solution, see that it is nearly at boiling point, then there is no fear of its crystallising before the whole is added. Never omit to wash out the flask or tube with a small quantity of alcohol reserved for the purpose, and, *finally*, with some of the emulsion itself, well shaken up to take up every trace of silver.

Ripening the Emulsion.

The length of time an emulsion is kept, after sensitising, to ripen will depend upon circumstances. The main object of this keeping is to permit the salts to combine and so produce a certain degree of sensitiveness. But this is not all; it should always be borne in mind that, by keeping, the emulsion becomes denser or 'creamier,' and this feature is in some respects of quite as much importance as the other. With an emulsion containing a large excess of silver it is not possible to extend the keeping beyond a certain point, but in such cases the physical change proceeds more rapidly, and a creamy film is produced in less time than when the soluble haloid is in excess. With an emulsion containing free soluble bromide it is frequently a good plan to only partially sensitise, *i.e.*, to add only a portion of the silver at first, and to keep it for some days, or even weeks, adding the remainder of the silver a few hours before required for use, or pouring out to wash. A small quantity of old emulsion, if in perfect condition, will often greatly improve the working of a new sample by conferring that creaminess in which it is deficient.

WASHING AND ORGANIFYING THE EMULSION.

Washing the emulsion is the crucial point, and upon the manner in which this is performed very frequently success entirely depends. There are many methods, but for operating on a small scale nothing is better or safer than to pour out the emulsion into a dish, allowing it to set in a thin layer before washing. But I would go further than I formerly did, in recommending the washing to be commenced as soon as the mass has assumed a firm condition; where the means are at hand I would direct it to be actually dried by heat before allowing water to touch it. I need not here go into my reasons for this, but I may say that, instead of the removal of soluble matter being retarded by this treatment, the process is materially hastened and a better result in all cases obtained. I will say nothing of the various modes of precipitation, as these require special conditions.

I have recently been asked by more than one emulsion worker as to the advisability of adding an organifier to the finished emulsion. I strongly object to such a course, but if an organifier be necessary let it be applied during the process of washing. Let the first application to the dried pellicle be a solution of the selected organifier, and let this act for a quarter for an hour, then finish washing in the ordinary manner.

DRYING THE EMULSION.

Do not use alcohol to hasten the drying previous to re-solution. I do not say it is impossible to gain good results after such treatment, but I will assert that when such do occur, better would have been obtained if the emulsion had been fairly dried.

REDISSOLVING THE EMULSION.

Beware of trying to dissolve sufficient of the dried preparation to make ten ounces of emulsion *in a ten-ounce bottle.* Use at least a twenty-ounce, or, if you have not one, add only half the solvents, *then* the ten-ounce bottle will allow shaking room, which it would not *if full.*

ADHERENCE OF FILMS.

By C. PIAZZI SMYTH (Astronomer Royal for Scotland).

ONLY a few weeks ago I had the honour of receiving from a very learned Professor and Doctor of Divinity of notable standing in an ancient university, a printed pamphlet setting forth a *discovery* he had lately made in the course of a high application of photography, but a discovery which had taken him with the utmost astonishment.

It was, indeed, something positively bewildering to him, afflicting him with an almost sublime awe, and threatening such dire confusion to much that he and other great philosophers had recently been doing or were preparing to do in photographic applications to their own respective sciences, that he very nearly quailed at the idea of publishing it; and yet, as with admirable nerve and high-souled morality he finally concluded to do, he published a frank confession of the case, and considered that in that way both least harm would be done and condonence more readily extended to him for having such a disturbing discovery to announce, and announcing it.

And what was the discovery?

It was this. In one of several photographic plates consisting of dry gelatine films on glass, bearing developed impressions on them of the Pleiades stars as focussed in a large telescope, *one* part of *one* of the films, when examined under a compound achromatic microscope, showed some just sensible indications of having to that small extent stretched or warped in some way after having undergone, or while undergoing, all the intermediate dippings, floatings, soakings, washings, &c., connected with developing and fixing the latent image, and then drying again.

And this was really all. This was what had come forth like a thunderbolt out of the blue Italian sky of the present prosperous days of modern dry-plate photography, to scare one of the most erudite professors in one of the earliest founded chairs of science in this country: and to scare, it is to be supposed, equally many other very learned gentlemen, who are now using photography so delightfully for their own purposes; and so easily, too, by the method of purchasing dry plates ready sensitised to their hands, for a few pence apiece at any one of the dozens of now successful manufactories of them; and they have all been carrying on their photography in this manner for at least three or four years, with an innate certainty all the time in their minds that a gelatine film on glass is, and must be, as the glass itself; so that through all its washings and dryings it can alter no more than does the glass, or with its infinitesimally small expansions and contractions from anges of temperature alone.

Now this is a memorable indication of the historical depth and recording range of some university learning; for how far back could the researches of such a photographing professor have extended, when only twelve years ago the main trouble with gelatine films used to be their 'frilling up' from and off the glass plate on being wetted; or, like many other sensitive films, their 'substrata' notwithstanding, quitting the glass plate altogether and going bodily 'down the sink,' or, if perchance happily recovered from there and set on the glass plate again, drying down to and again adhering to that, but with one or two odious wrinkles introduced? Or, again, as I experienced myself with the once much-vaunted 'indiarubber substratum' of that ancient and now apparently forgotten day, never actually leaving the plate, but when the substratum has got rather too thick by evaporation of the chloroform solvent, then how it pulled the collodion film about as it dried into such strange contortions—that a view of the Time Gun-fire on Edinburgh Castle as viewed from the Calton Hill, showed the really level roof of Dugald Stewart's monument so fearfully inclined to its own supporting columns, the North Bridge going up hill in such a mighty curve, and church steeples bending to or from each other, that the whole picture became a sort of representation of a still greater earthquake wave than that of the poor city of Charleston, S.C., passing through modern Athens. And all this dreadful appearance was on a scale to come out visibly at the very first glance with the naked eye, and before any scientific examination with a magnifier like that in the eye-piece of a telescope had begun.

Such, however, having been the case only a very few years ago and the kind of trouble then attending on every one preparing their own sensitive plates, why, at that rate, if the new and purchasable dry plates can now be manufactured for the general public, with such a degree of perfection that a full-blown professor in the year 1886 is indignantly struck with an immense astonishment at finding a microscopic indication at last of something minutely wrong in one of them—I do not doubt his account in the least—I only say that he involuntarily shows thereby that there must have been within the last twelve, even ten years, some admirable inventors and gifted improvers at work in the professional photographic field whose names ought to be inscribed in letters of gold in every public temple of science, as well as alluded to with honour and thanks in every scientific memoir which has been enriched with astronomical photographs on *their* plates and *their* most adhering films.

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AN EXPERIMENT AND AN EXPERIENCE.

By R. L. Maddox, M.D., Hon. F.R.M.S.

The former, although not absolutely successful, while the latter was most unpleasant, may, perhaps, bear a brief narration, as an answer to the call from the Editor of the Almanac to 'fill up the ranks' which yearly comes with its customary note.

To one who is only an old hand amongst the reserves, and who has done no kind of photographic work for many months, some difficulty was felt about the step, nevertheless, in obedience, the accoutrements were gathered up by eight o'clock Saturday night of the 16th October. Then what next? Three weeks or so previously, instead of practising the new drill, I had been one day carefully pruning my tomato plants, cutting off all the superfluous shoots, and upon washing my hands, though not very soiled, I was much struck by the intensely yellowish-green colour of the lather. The idea at once occurred whether the chlorophyl of the leaves might not prove useful in converting the ordinary gelatino-bromide plates into the so-called 'isochromatic.' At once some leaves were gathered, the leaflets stripped off, cut up, and half an ounce of them put into a phial with three ounces of pure methylated spirit of wine. By the way of furnishing another experiment, the same weight of cut leaves, without the midrib, of the purple beet was placed in the same quantity of spirit of wine; both were corked and allowed to stand for three weeks with occasional shaking and then filtered.

Happening to have an unopened box of X. Y. Z.'s quarter-plates, which had been purchased about eighteen months previously, of the qualities of which I was totally ignorant, as they contained no instructions, &c., it was resolved on the said Saturday evening to soak some of the plates in the before-mentioned tinctures when diluted, and to test them on a colour scale which I had previously drawn in water colours on a card, each colour space being one inch deep by two inches wide, thus making a sort of seven-inch spectrum scale. In forming this scale, to avoid the risk of overlapping, the colours were not put on in washes, but simply painted on. When finished the card was pinned to a thin board, having a string passed through it to hang it up by.

Two drachms of each tincture were separately diluted with three ounces of pure boiled rain water, and the little dark lantern described in a previous Almanac (1885), with a thin sheet of yellow paper in front of it as an additional precaution, were carried into the dark room. No green-tinted paper was just then at hand, or it would have been substituted. Now comes the experience. The first plate had scarcely been laid in the dish of the diluted beet chlorophyl tincture and covered over, when different objects seemed imbued by a sudden desire to visit their neighbours, a slight perspiration was immediately felt, accompanied by pain in the head and extreme giddiness. Through this sudden faintness it was quite doubtful if the manipulation could be continued, but by dint of effort the two first plates were duly soaked, one for one minute, the other for two minutes, and placed in the drying box. Counting seconds was adopted, for I could not see the hands of my watch. Then the next two plates were similarly treated in the diluted tomato chlorophyl tincture and put away, by which time the headache had greatly increased, and I was glad to quit the dark room and crawl downstairs. Upon entering the sitting-room I was accosted at once with, 'Why, what is the matter? You look as white as a sheet!' The headache did not subside for forty-eight hours. Here was an 'old hand,' who had spent part of his life for hours together in the dark room under deep red, orange, and yellow light, knocked over by a trumpery few minutes in a dark room illuminated by a dim reddish-yellow artificial light. A novel experience! In connexion with this incident it may be stated that nearly a year since, when about to look over an empty house, on entering a small ante or coat-room off the passage, which had a rather large size window in it glazed with deep blue glass, the sun shining on the window at the time, I had scarcely entered the room before a sensation of giddiness, with a feeling of sickness and faintness, obliged me to return at once to the open air. In spite of surname, this article may plead a defence against lunacy, still, in connexion with this subject, it may be noted that some few years since it was proposed to treat the insane by confinement in rooms lighted through coloured glass, it being stated that certain colours had a most powerful effect in calming the patient and restoring the equilibrium, at least to a temporary quietude, in the case of the most violent. Thus, if there may be an unstable condition of the brain harmonised by colour vibration through the sense of sight, may not, on the other hand, the healthy brain be quickly disturbed by colour vision? Very possibly, and this example may not be a single experience, still it shows that under certain unknown conditions the dark room may have its terrors even for the adult photographer. Before leaving this subject, it may be stated that on developing the plates in the daytime a few days later, the same lantern being used, but with a green-tinted tissue-paper in front of it, and the three apertures in the shutters to the window which admitted red light being sobered down by some thicknesses of yellow and orange paper, no ill effect was felt.

Rainy weather and sundry occupations put off the trial of the plates, but on the fifth day after their preparation the colour scale was hung against a dull brick wall, in the open air, and focussed with an Andrew Ross' fifteen-inch landscape lens, using the six-eighth stop, the camera being placed about four or five feet from the scale. The sun was shining, but not by any means brilliantly, when an undipped plate from the box was exposed for fifteen seconds, and then developed with a soda developer freshly made. The exposure seemed to be nearly right. A second plate was tried, using an ammonia developer, but the plate fogged hopelessly. Then one of the beet tincture plates was tried—unfortunately, the sun was now clouded by thin, grey, misty clouds; the exposure was lengthened to forty seconds, then, as this on development proved scarcely sufficient, the second, the two minutes' plate, was exposed for sixty seconds. The two tomato tincture plates were both exposed, and both fogged so terribly that it was concluded they had already been impressed by daylight, and curiously the gelatine surface did not correspond in appearance with the others. As I had staked my last shilling on the red jacket I did not like to give up the race to the purple. Accordingly, two more plates from the same box were dipped respectively for the one and two minutes in a fresh dilution of the tomato chlorophyl tincture, and dried. The sun shone out on the following day, so the camera was arranged as before, but no sooner was it in place than a darkish cloud covered the face of the luminary, though the edge of the cloud and the distance beyond were brightly lighted. There was no doubt as to getting entire cloudiness later on, so the one minute plate was exposed for seventy seconds, and directly after the two minutes' plate for ninety seconds; both, like the former, were developed with the same developer in the following way:—

The soda solution consisted of—

Recrystallised sodium carbonate	480 grains.
Potassium bromide	3 ,,

Dissolved in 10 ounces of hot water, and filtered when cold.

The pyro solution consisted of—

Saturated solution of neutral sodium sulphite	2 drachms.
Dry pyro	2 grains.
Ordinary water	6 drachms.

The latter when mixed was poured over the plate and allowed to remain two minutes, then poured off into two drachms of the soda solution in the developing glass and directly reapplied, the tray, covered with a card, being gently rocked from time to time and occasionally watched. When the image had slightly appeared, the blue and yellow were the first spaces visible; two more drachms of the soda solution were added, and the image allowed to develope slowly, the tray remaining covered. The developed plates were washed and fixed, and after fixing were again washed and soaked for some hours in a large pan of water. There was no image to be seen at the back of the plates of any of the series, so only surface appearances were taken as indications when to cease the development, which was when the entire scale was out on the plate. These experiments, though so imperfect, by their results warrant, I think, a fuller trial, especially with the tomato-leaf chlorophyl, which, although it may not reach the advantages claimed by Mr. Ives, of Philadelphia, U.S.A., for the chlorophyl of the blue myrtle, may still be found useful. It must be remembered no colour screen was used, and the plates must be regarded as very slow compared to the present ordinary plates of various makers. The results may be tabulated thus:—

	Exposure, Sec.	R.	O.	Y.	G.	B.	I.	V.
Ordinary plate	15	1	1	4	2	5	2	1½
Beet 1 minute plate	40	1½	1½	4½	2½	5½	2½	3
,, 2 ,,	60	2	2¼	5	3	6	3	3½
Tomato 1 ,,	70	2	2½	5	3½	6	3½	4
,, 2 ,,	90	2½	2½	5	4	6	4	5½

On account of the variation in the light, these results cannot be entitled to anything more than experimental, the monochrome scale being expressed in figures. The strength of the solutions, time of exposure, and kind of developer, may each need alteration. An ordinary plate of the same batch was tried on Leighton's chromo-lithograph of Millais's picture, *The North-west Passage*, hanging in a bedroom, and an exposure of 105 seconds given, but it would have taken another minute to secure the male figure under such imperfect light. There is such a variety of colour in the print that it would need a good isochromatic plate to give the tint scale in monochrome.

SULPHITE OF SODA FOR FIXING PRINTS.

By Captain W. de W. Abney, R.E., F.R.S.

Since last year I have, when making prints on albumenised paper, rarely used any fixing agent for them but sulphite of soda (the neutral salt, of course), and in my hands it has proved so excellent that I cannot but recommend its employment. Perhaps photographers are too conservative to try a new thing of this description, when the old hyposulphite is more easy and more economical to use; or, perhaps, they have used it and found it wanting, or, perhaps, that the prints have had an attack of jaundice, and so dropped its use without further ado. That jaundice will show itself at times I am quite aware, but it is surely better to show itself during the infancy of a print than in old age, for then we can secure 'the survival of the fittest.' But this jaundice is not necessary: it is a fault due to the niggardly habits of the photographer, who dreads to use twenty grains of the new stuff where he only used one of the old hyposulphite. In tracing causes of jaundice, which I have not met with in my own case, I have always found it due to one of three things—to alkalinity of the sulphite; to the sulphite being old and, through careless keeping, being oxidised to sulphate; or to using the fixing bath for too many prints. In my own practice I use two baths of sulphite, made as follows:—

Sodium sulphite	2 ounces.
Water	10 ,,

They are tested for alkalinity, and if alkaline a little sulphuric acid is dropped in till the solution smells of sulphurous anhydride. It is then gently warmed to expel the gas, and when cooled is used. Not more than one sheet of paper should be fixed in the one bath of the above quantity, and for security's sake the prints, after remaining in it for a quarter of an hour, should be passed into the second bath. The second bath may be used as the first bath for the next sheet of paper, and a new bath made for the second sheet, and so on. No doubt there will be exclamations anent the expense of this fixing bath, but I believe it to be cheapest in the end, since prints fixed in it should 'stand,' and have stood so far. It should be remembered that toning must be carried on further than when gold tones darkened by decomposition of the hyposulphite are obtained.

NATURALISM AND PHOTOGRAPHY.

By H. P. Robinson.

Fashion changes in art as well as in other things. Pre-Raphaelitism was a protest against the classicism that was in its decadence. The art of the period, when it arose, was all but devoid of purpose, thought, or imagination. The Pre-Raphaelites added all these qualities to wonderful manipulative excellencies, but now the whirligig goes round and naturalism protests against thought. It is the protest of grammar against poetry; Lindley Murray is preferred to Shakespeare. In all arts but the photographic, craftsmanship is taking the place of imagination and design. In painting the artist has no further use for the higher qualities of his nature. He need not think; he has only to sit down and copy nature by a fashionable recipe, which does not leave much likeness to her in the result. The clever suggestion of the first impression of a scene is made to do duty for all the qualities that once went to the making of a picture; in music, execution is superseding melody; in poetry, the way it is said is more considered than the thing said; the proper relation of the sestet to the octave in a sonnet has a greater value than all the prodigal wealth of imagination in *Paradise Lost.* The craze has extended even to the libraries, and it is now difficult to get a sound tale, such as those in the *Waverley Novels;* the interest is not now in the plot, but in psychological analysis and the way the philosophy of human life is presented. It is fortunate that there is now little room for skill in craftsmanship in our own art. It would be a curious instance of time bringing round its revenges if photography, once the most prosaic and mechanical of all the arts, should become the most poetical. But processes are so simplified that there is little room for the ambitious photographer to shine, except in the intellectual side of his art. It is only by the addition of those qualities which begin where photography proper ends, such as selection, choice or invention of subject, composition, light and shade, and expression, that the clever operator can show any real skill beyond his fellows. This is always observable in exhibitions. Visitors pass quickly by the ordinary portraits and landscapes and linger only to enjoy themselves when they come to a picture embodying a thought, however poor the thought may be, and, to some extent, however indifferently the thought may be expressed.

In keeping to the old, well-tried rules of art, the photographer need not neglect what is good in the new. He must study 'values,' now the fashionable study in art, not that he may render them accurately as they are in nature, for that is mechanically and absolutely done for him in a properly-exposed and developed plate, but that he may create them before he renders them, a thing that an orthodox, naturalistic painter would disdain to do. For instance, he has to photograph a grey landscape; he must exercise his invention and ingenuity to introduce some dark or light object in the foreground to give value to the misty scene. This is the use which a study of values can be to the photographer.

Study art if you want to make pictures; you cannot learn by studying nature only. Nature does not teach art, but she will make suggestions to you when you have learnt to see them. Any one who has not studied from books and pictures does not see ten per cent. of the beauties of nature; he does not know how to see them. Let your picture look as if you wanted to do the best with your subject. You may not succeed, but it will be plain to an expert whether you have tried or not. When you fail hunt down the failure. The subject might have been delightful, but was badly lighted; it is evident you might have done better by waiting. A figure might have pulled the composition together;

you have neglected this. The negative is too intense and chalky; reducing might have remedied the fault. Never be satisfied if you want to succeed. Above all, try to fix this admirable definition of art in your memory,—'Art is interpretation by means of a creative idea, and never a stupidly exact copy.'

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THE POTASH DEVELOPER.

By F. C. Beach (New York).

In a country where ammonia is so universally preferred as an alkali in the pyro developer, it may seem useless for me to attempt to point out some of the advantages of the potash developer, which amateurs and professionals here find that it possesses over ammonia. But in view of the many discussions observed in connexion with the potash developer which we find frequently reported in the English journals, I am led to believe there is a respectable minority who strongly favour the potash, and for this reason I trust what is said concerning the subject will receive attention.

First. The well-known red and green fog invariably associated with the use of ammonia is banished.

Second. Being extremely soluble in water, very concentrated solutions of carbonate of potash are readily made, easily handled, and remain for any length of time, regardless of extreme changes in temperature, of a uniform strength. For this reason such a solution is reliable; it is not fickle like ammonia—good to-day and uncertain a month hence.

Third. Upon a large majority of different makes of plates it acts uniformly good, and when used in comparison with ammonia, invariably brings out more detail in the film. Especially is this noticeable in instantaneously-exposed plates; much more potash can be added to the developer, in proportion to ammonia, without producing any kind of fog. We thus have a developing agent that we need not fear.

Fourth. No restrainer like a bromide is necessary, since, ordinarily, there is sufficient bromine evolved during the process of development to act as such in a slight degree; hence we dispense with one of the old requirements, 'bromide,' and simplify the solutions.

Fifth. Without 'bromide' the alkali exerts greater developing force, bringing out details which would otherwise remain undeveloped. Again, a much smaller quantity is required to do the same work, thereby preventing any tendency to frilling when soft films are employed.

Sixth. The powerful corrosive nature of potash enables us to secure ample density with a small amount of pyro.

Seventh. When sufficient sulphite of soda is used in conjunction with the potash, soft, clear, quick printing, grey coloured negatives will be obtained, thus avoiding the use of alum clearing solutions. With ammonia the colour is usually a slow olive tint.

Eighth. The unpleasant and unhealthy fumes of ammonia are entirely dispensed with. Instead we have an agent that it is a pleasure to work with.

I might suggest several other advantages and reasons why the potash developer is desirable, but what I have set forth will make it clear that the developer is worth trying. It works particularly good in the hands of beginners, for they do not have to be cautioned against the dangers of green or red fog, but invariably obtain successful results, except when through faulty apparatus the plates are damaged.

By a series of recent comparative experiments, made under the auspices of The British Journal of Photography, it is proved beyond question that there is more developable power in *carbonate of potash* than in any other alkali, which only confirms the results of my experience and hundreds of others.

As there has been some criticisms made upon the formula of the 'Beach Developer,' as stated in The British Journal Photographic Almanac for 1886, it will be proper here to give the formula as I recommend it now, all the solid ounces being based on 437 grains to the ounce.

No. 1.—Pyro Solution.

Sulphite soda (chem. pure crystals)	4 ounces.
Warm distilled or melted ice water	4 ,,
When cooled to 70° Fahr., add	
Sulphurous acid water (strongest to be had)	3½ ounces.
And, lastly,	
Pyrogallol	1 ounce.

No. 2.—Potash Solution.

A	Carbonate potash (chem. pure)	3 ounces.
	Water	4 ,,
B	Sulphite soda (chem. pure crystals)	2 ounces.
	Water	4 ,,

Mix A and B separately, and then combine in one solution.

It is not of so much consequence to use distilled water in the potash solution as for the pyro, but when distilled water is convenient I advise its use in both solutions.

No. 1 and No. 2 will retain their efficiency at least two years, if not longer. To the amateur I recommend slow and sure development, for we are after the best results, not for what money we can make out of our work. Supposing we have a 4¼ × 6½ plate, requiring two ounces of complete developer. Pour into the graduate one drachm of No. 1 (equivalent in all to six grains of pyro) and twenty minims or a quarter of a drachm No. 2, then fill the graduate to two ounces with water. Now flow this over the plate; if after two or three minutes no trace of the image appears in the brilliant high lights we know the developer needs more energy, hence add to the graduate twenty minims more of the potash solution, mix with the developer, and return to the plate. In a moment development will be noticed, and if it proceeds too slow, and the shadows refuse to divulge details where expected, keep adding small quantities of the potash at short intervals until two and a half drachms to the two ounces of developer have been added; then stop. If after immension for a few minutes in this strengthened solution nothing more can be brought out, it is advisable to remove the plate and fix.

The amount of density obtainable is regulated by the quality of the plate—whether it is rich or poor in silver—and the quantity of pyro in the developer. Films rich in silver, and of a creamy, matt surface appearance, require a small amount of pyro. Those of a thin, greyish appearance by the non-actinic light need a good proportion of pyro, and are generally the fastest plates. I make it a practice to find out, by one or two trials, how much pyro a given brand of plate needs, then I always obtain the correct density in successive negatives. By having the pyro in fluid form it is quickly and accurately measured.

If the plate is over exposed, soak it first in water, two ounces containing two drachms of No. 1, for five minutes, then add one drop of No. 2 at a time at intervals until development commences. Unless overwhelmingly over exposed, a good negative will result. Or if the old developer has been saved, start the over-exposed plate in that, and finish with a fresh developer containing a mere trace of potash. If over exposure is discovered during development, immediately dilute the developer with three times the amount of original bulk of water, and add one or two drachms of the pyro solution. In using dry pyro, add two ounces more of sulphite soda to the potash solution.

With pure chemicals, good water, and slow development, most exquisite results will be obtained, which will be a satisfaction to the operator as well as his friends. Two and a half years' steady use of this developer convinces me that it is one of the best that an amateur or professional can employ.

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MINOR MATTERS IN DEVELOPMENT.

By Andrew Pringle.

When I use the word 'minor' I use it in distinction to the subjects that come under the head of the chemistry of development proper and to the considerations of exposure, technique, and deeper science generally. These, the vital subjects, I would call 'major matters.' My object is simply to glance at the general precautions necessary to obviate failure, and not to go into the system that I would advise for one wishing to achieve brilliant success. However perfect our purely chemical system may be, disregard of the 'minor considerations' will endanger, if not preclude, success.

In the first place I will mention the light of the operating room. If we have too much light we shall more or less hurt our results perceptibly or imperceptibly; if we have not enough light success is only a matter of chance, and in delicate operations with delicate materials the betting is heavily against success if chance only be trusted. Our window or lamp must be of such a kind as to enable us, with perfect safety to our plate, to examine the progress of development frequently and closely. When not actually under inspection our plate ought to be covered up from light entirely. As to *colour*, some people like colours such as ruby or layers of orange amounting to red, while others prefer the yellower colours tinged with green. The yellow media are usually translucent, the rubies are usually clear glass. Daylight and artificial light are both available, artificial light being more steady and forming a better standard for comparisons, while daylight is more easily procured and cheaper. My own practice is to have in my developing room, and close to my sink, a lantern glazed with one thickness of clear ruby glass. I develope almost always by daylight, and when I think the development is verging on completion I turn up the gas in my ruby lamp by means of a bye-pass tap fitted outside the lantern, and with this standard gaslight I judge of the progress of all my developing operations. For various reasons I consider this method superior to all others, for the eye is not fatigued and does not lose the fineness of its perception by constant watching of the plate in one light. We all know how slowly a child seems to grow or a friend to yield to a disease when the child or the friend is constantly under our notice; but let us go away for a time and *then* see our child or our friend, the progress of growth or disease is for more plainly discernable to our eye. By daylight, then, I judge generally the progress, by my standard light I test finally the results of development.

I am always astonished at the pertinacity with which many amateurs demand formulæ—it is ' " give, give " us a formula.' And I sometimes think that the more complex the formula the better they are pleased, as if there were ' luck in odd numbers ' or something talismanic in fractions of a drachm. A certain formula for potash development has received an immense amount of support from amateurs—'*patulæ recubantes sub tegmine fagi* '—to me its chief merit seems to be intricacy. I can conceive nothing more simple or convenient than ten per cent. solutions of the reagents, with adjuvants added as required. For instance, what is easier than to take an ounce of potash carbonate, let it dissolve in eight or nine ounces of water, and then make up to ten ounces with water, and to remember that every ten drops of this contain one grain of potash? So with the pyro. Why not take an ounce of pyro, and make, with water containing *quant. suff.* of sodic sulphite, or sulphurous acid, or whatever you please, a solution amounting to ten ounces? Never run round a fence you can step over. These mysterious formulæ do a lot of mischief, for amateurs using them never really know what amount of the reagents they are using, and so they work blindly and learn nothing accurately of the real effect of their modifications. If the solutions are made up in the simple way I recommend, the whole operation of development becomes an intelligent one, for the mixing of the developer depends upon a knowledge of the quantities of the reagents required, and not upon a blind calculation of drops of 'A' and 'B.' Thus: I have a 10 × 8 plate to develope with a normal developer. I require five ounces of developer, each ounce to contain two grains of pyro: $2 \times 5 = 10 \times 10 = 100$ minims of my ten per cent. pyro solution; each ounce to contain eight grains of potash: $8 \times 5 = 40 \times 10 = 400$ minims of my potash ten per cent. solution; each ounce to contain half a grain of bromide: $\frac{1}{2} \times 5 = 2\frac{1}{2} \times 10 = 25$ minims of ten per cent. bromide solution. Into my measure, then, I put 100 minims of pyro solution, 400 minims of potash solution, and 25 minims of bromide, and when I *make up to* five ounces I have my exact quantities of reagents in each ounce of the developer, and *I know* precisely what I have. Perhaps I want to add to each ounce one minim of pure ammonia. I have my ten per cent. solution made up by adding nine ounces of water to one ounce of ammonia. I want five minims of ammonia, so $5 \times 10 = 50$ drops of my ten per cent. solution.

For a long time I kept my bromide mixed with my alkali. This is very bad. How I was foolish enough to continue this practice for years do not know; I look back upon it now as a sort of nightmare.

There is much diversity of opinion about the washing and *aluminating* between developing and fixing. No washing at all is *necessary*, but the omission of it leads to defilement of the fixing bath, and this looks bad and is apt to stain the plates. Plates, therefore, ought to be fairly well washed after development.

The fixing bath is a matter of much greater importance than is usually admitted or acted upon. The first thing about it that is usually overlooked is that it must be distinctly alkaline; this is absolutely imperative for all paper-printing processes, and I consider it important for negative processes also. But a far more serious mistake, and a common one in negative work, is not allowing sufficient time for perfect fixation. I know all about the amateur's anxiety to examine his negative in the open light, having had the disease myself long and frequently, but I here sound a loud note of warning. The fact that the white silver salts have disappeared from the back of the plate is not at all a certain test of fixation. When the white salts first disappear the plate is *not* fixed, and it is as well to allow *as long again* for the complete fixation to take place. I have myself spoilt many a plate with impatience, and it is only long after the negative is finished that the mischief is seen.

Another thing that must be carefully attended to is the *strength* of the fixing solution. A very strong solution of hypo will not fix some plates at all, and I question if such a solution will eliminate the superfluous silver salts *entirely* from any plate or film. I know that I have spoilt many plates by inattention to this point. I certainly never would wash a plate that *showed* the silver behind, and, as a rule, I leave my plates for ample time to ensure fixation under suitable circumstances; but if the hypo solution be stronger than about one part of hypo to four parts of water the fixing takes place very slowly, if at all, in some cases.

The 'fixing' or 'clearing' of a negative or print, it must be remembered, depends on a double chemical action; first, the formation of a silver hyposulphite, then the solution of that by an excess of soda hyposulphite. Therefore, the hypo solution must be sufficiently strong and act sufficiently long, else the silver hyposulphite may be left, and will be decomposed if left. Again, if the hypo solution be too strong a mechanical obstacle, as I believe, is raised, and the gelatine or albumen (but more certainly the gelatine) is not penetrated by the hypo, and so no proper fixation takes place.

Blistering and frilling are also frequently caused by too strong hypo. If either of these defects arise a little sodium chloride should be added to the first washing water after fixing. When hypo is freshly dissolved a very low temperature is usually observed; it is as well to wait for a time before putting into such a cold solution either a plate or a print.

The matter of washing plates scarcely comes under my heading, but as my last remarks seem to lead up to the subject, I shall say a very few words on the matter. I always look with doubt on the receptacles I see so frequently for washing a lot of plates at one time. I admit they are often necessary and sometimes useful, but I will say that when a lot of plates are washed together the washing must be protracted, and the changes of water constant, or very frequent. A single plate in a dish, or (better) under a rose tap, does not take so long to wash as many appear to think. But a lot of plates in a box, I don't care how perfect the design, take much longer to wash than most people appear to think.

I think it useful to alum all plates after fixing: if the negatives are very thin I give them alum alone; if not thin I add acid to the alum.

I have written more than I intended—not more, I hope, than acceptable, but really I must now 'put up the shutters.' I offer my compliments and best wishes for 1887 to all photographic *confrères*. Look after the 'minor matters' and the major ones are greatly simplified.

TRIPODS.

By Ellerslie Wallace (Philadelphia).

When we look back to the old standard authority Hardwich, we find that 'tripod stands should be firm and unyielding.' Now, although this was written at a time when exposures ran by minutes, or even sometimes by half hours, it should be considered of equal importance at the present time. In criticising the outfit of the average amateur, it will often be found that the tripod is anything but trustworthy, especially if the larger sizes of boxes are mounted upon it. One frequent cause of unsteadiness will be found in the fact that the bellows of the camera will necessarily expand more or less according to the focus of the lens. When lenses of very varying foci are used, it would be worth while to have at least two screw plates in the baseboard of the camera put at such spots as would make the camera balance well when set on the tripod.

In respect to the tripod itself, it will be found that oak or ash will be both durable as material and very free from spring. I believe it to be a great mistake to cater to portability by making the legs, particularly in the upper parts, very thin and light. The extra bulk and weight caused by, say, one-eighth of an inch more of the solid wood will be no great matter, and if a very short parcel is desired when the legs are folded they may be made in three sections instead of two. In this case the breadth will be somewhat greater, the upper section having to contain a double instead of a single course. But in any event I must urge that the head of the stand be of good size, not so much for the sake of support to the camera, but to allow the legs to be well spread apart at their top ends, and this gives the advantage also of rendering the screw-bolt always easily accessible by the hand. Another point of great importance is to have the legs fitting neatly and tightly on the pins on the tripod head. A very little play here will render the whole affair shaky. Three pieces of cork will be valuable as 'shoes' when working on marble floors &c.

IMPROVISED PLATE CARRIERS.

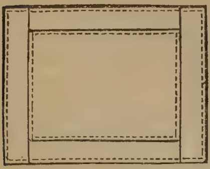
By Ernest Graham.

It is difficult, in response to the Editor's request, to find a subject for an article for his annual, and in submitting the following suggestion I may premise that, as I am myself 'only an amateur,' it is intended only for amateurs.

On an occasion some time ago, while staying with some friends far away from home, I ran short of plates, and ordered a fresh supply from the maker; these arrived in due course, but instead of being whole-plates they were only 6½ × 4¾. It would have been annoying enough under any circumstances to have to wait the three or four days, at least, that would be necessary in order to replace them, but in this particular instance it was especially exasperating, as I had, on the morrow of their arrival, to officiate with my camera at a big 'field day' in the shape of a garden party, and my friends, and my friends' friends, were already anticipating their copies of the numerous groups that were to be taken—an exemplification, as it now seemed to me, of the proverb which warns you not to 'count your chickens before they are hatched,' or, as the French have it, 'to sell the bear's skin before killing it.'

Something had to be done, that was clear, and that something was to utilise the half-plates—but how? Use carriers. Quite so; but I had no carriers, and the only joiner, or worker in wood, within miles, though quite capable of tackling a cart wheel or, indeed, a whole waggon, or a few miles of fencing, would have been put upon his mettle if asked to undertake even so delicate a job as a stout packing-case! So I concluded I should have to trust to my own resources—at first sight not at all a lively prospect.

However, after some cogitation I set to work. I borrowed a glue-pot from the gentleman to whom I dare not trust the job, and, that being secured, I next 'annexed' a cigar-box from the smoking-room, and these, together with two or three of the empty boxes in which my plates had been packed, formed my sole material, while my solitary tool was my pocket knife.



First of all, I cut a number of strips of wood from the cigar-box, six and a half inches long and one inch broad, and a similar number the same length, but one-eighth of an inch narrower. Four of these when put together, as shown by the solid lines in the diagram, formed a frame measuring 8½ × 6½ outside, with a central opening 6½ × 4¾.

Next from the millboard forming the tops and bottoms of the empty plate boxes I cut out solid frames, measuring about 8¼ × 6¼ outside measurement (or just small enough to fall into the dark slide without touching the rebate) and with a central opening 6¼ × 4½.

These, as well as the strips of cigar wood, having been strongly glued were put together as shown in the diagram, in which the solid lines represent the wood and the broken ones the millboard, and the whole having been placed under pressure in a pile overnight I had in the morning half a dozen plate carriers, which not only served their purpose on that occasion but several of which have done frequent duty since.

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ALUM AND ACID *VERSUS* YELLOW NEGATIVES.

By G. Watmough Webster, F.C.S.

As an old wet-plate worker and experimenter, I may, perhaps, be biassed in favour of the velvetty colour so dear to the eyes of those who have seen the collodion negative process pass through all the stages of its career, from the 'converted' positive, or the 'pyro' developed image, to the period when its full glory was seen in its latest development, the iron-produced image intensified by pyro and silver—the mode of working by which nineteen out of every twenty wet plates in existence were produced. Yet, whatever my own predilection may be, there are very many other workers who hold similar views, so that a few words of explanation how I employ alum and acid, and why I consider its use desirable, may not be unsuitable for the pages of the ALMANAC.

Speaking first of *why* I use it, I am willing to grant that in the first instance my desire was, when I began serious work with gelatino-bromide plates, to produce negatives as little unlike the then more familiar wet-plate negatives as possible. Every one who has photographed in pre-gelatine days knows how extremely deceptive gelatine negatives were until the worker became more thoroughly accustomed to their appearances. In my work I found that I obtained so much smaller a number of badly judged results when I removed the yellow colour, that I communicated to my friends, and, as past pages of THE BRITISH JOURNAL OF PHOTOGRAPHY will show, published, the extremely simple method I employed to remove the yellowness, namely, the placing the negative in a bath of citric acid solution, a plan still further improved for practical application by the suggestion (due, if I remember rightly, to Mr. Cowan) of combining alum with the acid. The function of the alum in the mixture is not to assist in the clearing, but to harden the film, and thus prevent frilling. I have many times since tried development with and without the acid against one another, but I unhesitatingly express my opinion that, when the negative is a good one, it is improved by the process, and I further say that when the acid is regularly used the operator is far better able to judge of the quality of his results than he would be if the usual pyro yellow colour were present. I do not say that all negatives would be better treated with alum and acid, for there are many capable of giving fair results which, if their yellowness were removed, would only permit very feeble prints to be obtained; but, as there are also many negatives in existence which require dodging to get good prints from, it would be as reasonable to expect all negatives to be so dodged as it would to ask for them all to be made yellow.

It must be remembered, too, that the degree of depth which this yellow tone attains varies most considerably, some negatives being but faintly tinged with it, while others are of a most jaundiced hue. Here, again, is an element of uncertainty. I further maintain that, as a rule, the image will contain a greater range of tones when the yellow is removed. I have often tried the experiment of submitting a good printing negative which was slow, through yellowness, to the acid bath, and found a decided improvement in delicacy and softness; for occasions, experimental and otherwise, do arise in my practice when the acid bath is not used.

My contention is that negatives treated with the alum bath are more uniform, more readily and correctly judged, and better in quality, as a whole, than when they are not submitted to its action. As to *how* I use it the following is my formula:—

Chrome alum	6 grains.
Citric acid	3 ,,
Water	1 ounce.

Of course, I mix up a quantity of solution at once, the proportion when a gallon is made up being, as near as is necessary, two ounces of chrome alum and one ounce of citric acid. I have tried other acids, but without seeing any great difference in action; hence I have adhered to my original practice.

Most photographers, when they employ the acid at all, use it after fixing ; I always use it before I fix, taking great care that the negatives are thoroughly washed before placing in the hypo. From this my readers will judge, and truly, that I do not develope my plates as soon as I have exposed them. I think that to do so is a great loss of time, and when exposures are made in view of a developer well in hand there is little fear of error in exposure.

Finally, I would advise all who have not yet adopted, *en permanence*, the alum and acid system to give it a fair trial. I have a strong opinion that the trial would end in its permanent adoption.

A PHOTOGRAPHER'S LIBRARY.

By W. Jerome Harrison, F.G.S.

I am rather surprised to find how few photographers possess good collections of books illustrating the science to which they devote the whole or a part of their time. It must be that they do not realise the value which such a library would possess, or perhaps they think they 'have not time to *read*.' But the fact is that photography is pre-eminently an evolutionary science ; process has grown out of process in the most logical manner, and the key to the thorough understanding of what is being done to-day lies in the history of what has been done in the past. Now we must study this history by means of books. I have collected the titles of about 300 books or separate publications which have been published in the United Kingdom upon the subject of photography. I am sorry to say that in no single library, public or private, so far as I know, can all, or even two-thirds, of these works be consulted. Our great national library at the British Museum (tickets for the reading-room can be obtained from the Principal Librarian, Mr. E. A. Bond) contains, perhaps, the best collection, but even it is lamentably deficient. The Library of the Patent Office in Chancery Lane (open free daily from ten to ten) contains an average collection of books on photography, due probably to the connexion of Colonel Stuart Wortley with that institution ; and the Educational Library in the South Kensington Museum has also a few books on photography. Other public libraries have but the scantiest numbers of works on this subject. Those who live in the provinces ought to try to influence the committees of free libraries to place representative books on their shelves. Here, in Birmingham, we have a magnificent Central Free Library, with its Reference Department (80,000 volumes) and Lending Department, besides three Branch Free Libraries in different parts of the town. How Londoners exist without such institutions I cannot think.

Every photographic society ought to consider the formation of a library as one of its chief objects. I earnestly hope that the Convention may lead the way in this matter. I believe that both money and books would be freely given to aid in the formation of a really first-class collection ; and these might be borrowed by members living in any part of the kingdom, especially now that such facilities for transport are offered by the parcels post. All our great scientific societies possess libraries of this kind ; and in my own case I can bear testimony to the most valuable assistance which I have received from the grand library of 30,000 volumes formed by the Geological Society

Besides aiming at the acquisition of *every* English book and periodical on the subject, a good photographic library ought to contain a representative collection of foreign works. For American books this could be hardly too complete, and no doubt our friends across the 'herring-pond' would gladly aid in the work. But how many of our workers are acquainted with the splendid books by Eder (*Ausführliches Handbuch der Photographie*) and Davanne (*La Photographie*)?

As the foundation of a good library nothing can be better than a complete set of one—or better, both—of those periodicals which have so largely aided the progress of our science—THE BRITISH JOURNAL OF PHOTOGRAPHY and *The Photographic News*, together with their accompanying ALMANACS and *Year-books.* Add to these the books by Abney, Eder (translation), Hardwich, Tissandier (translation), Hunt, Robinson, Lake-Price, Jennings, Burton, Hepworth, Liesegang (translation), and Vogel (translation)—I name only a few books which I know to be in print—and a fair foundation will have been laid. For books which are out of print Messrs. Wheldon (Great Queen Street), Wesley (Essex Street, Strand), or Reeves & Turner (Strand), are likely firms; but the best plan is to advertise your requirements in THE BRITISH JOURNAL OF PHOTOGRAPHY.

But a photographic library should not be confined strictly to books and periodicals on photography; it ought certainly to include the best works on art, chemistry, optics, and physics.

The man who combines the study of books with the practice of photography will find many valuable hints in the works published ten, twenty, or even thirty years ago. Half the so-called inventions and discoveries of the present day are only adaptations and improvements of ideas made known long ago. Unsuitable, probably, to the state of our science at the time of their publication, they now furnish, in the hands of a skilful worker, the germs of valuable improvements. Even as an investment, I believe the collection of books on photography would pay. The army of workers is being rapidly augmented, and as more and more interest is felt in the history and development of photography, so will its literature be yearly more sought after and more highly prized.

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HINTS TO GELATINO-BROMIDE PAPER WORKERS.

By E. W. FOXLEE.

IT is an obligation, I take it, on every one who has the interests of photography really at heart to do what they can towards rendering its finished results, by whatever process they may be produced, as permanent as it is possible. With this object in view I shall point out what appears to me a weak point as regards permanence in connexion with the gelatino-bromide process, or, rather, as the process is generally worked, and suggest a remedy. The image is at present, and probably will continue to be, developed with the ferrous oxalate, and in the formulæ for making it, as issued by the makers of the paper, it is directed that the oxalate of potash and the sulphate of iron solutions should both be made decidedly acid. Consequently, the picture is brought out with an acid developer; added to this, the picture is very frequently further treated with a dilute acid. Before the print is immersed in the fixing bath it is washed, but in every instance where I have seen the process being worked commercially this washing has been of the most perfunctory character; consequently, when the picture is introduced into the fixing bath it contains a considerable amount of free acid.

Every one with but an elementary knowledge of chemistry is fully aware that the action of an acid on hyposulphite of soda is to decompose it, setting free both sulphur and sulphurous acid, and, in conjunction with silver salts, more complex compounds, which would require equations to explain them; which I will not inflict upon my readers. No one will deny, I think, that, if any of these substances exist in the picture, they will—well, to put it mildly—not conduce to its permanence. For this reason I suggest that before the picture is immersed in the fixing bath all traces of acid should be completely eliminated by thoroughly washing, or otherwise, and, as an additional precaution, the hyposulphite solution should always be kept slightly alkaline.

I am fully aware that an acid in the photograph at the time of its immersion in the fixing bath does not of necessity cause it to fade. We have ample evidence of that fact in the old calotype and wax paper processes, where the image was developed with an acid developer, and the negatives, as a rule, received but a very meagre washing prior to fixing. Faded negatives by either of these processes are an exception. Still, in working a comparatively new process it is always well to go on the safe side.

There is another point in connexion with the fixing of gelatino-bromide prints to which I will direct attention. In working the process commercially I know that many pictures are often fixed in the same solution, and far beyond what it is capable of fixing properly. The first action of the hypo is to convert the bromide into hyposulphite of silver, which forms with the excess of hypo a double salt, which is insoluble if the latter be not in sufficient excess, but otherwise perfectly soluble. Therefore if a sufficient quantity of hypo be not used to form the soluble double salt, the chances are that some of the insoluble hyposulphite will remain in the print even after washing. As a precaution against this, I recommend that after the prints have been 'fixed' in the ordinary way in one solution, they be immersed in a second bath of fresh hyposulphite of soda for from five to ten minutes before they are finally washed. If silver prints made by any process contain free sulphur, sulphurous acid, and also hyposulphite of silver (which is readily converted into sulphide of silver), or either of them, it is easy to see that, if they be kept in a damp place or are subjected to the so-called 'crucial tests,' they may show unmistakable evidence of want of stability. That many bromide prints which have been carelessly made do contain some of the deleterious matters alluded to (if not to a large extent) I have no doubt, but there is no reason why they should if proper care be exercised in their production.

THE GOLD IN SILVER PRINTS IN RELATION TO THEIR PERMANENCY.

By W. K. Burton.

The end of the year 1886 has seen a controversy raging throughout the photographic world as to the relative permanency, or chance of permaneny of the results of various rival printing processes. The Autotype Company started the hubbub by claiming for the process which they work a monopoly for the production of permanent prints, but afterwards admitted the platinotype process as a rival. The Eastman Company took up the position that 'bromide prints' were as likely, on the whole, to stand the test of time as the prints in various pigments produced and sold under the generic title of 'carbon prints.' The editor of a certain photographic paper remarked that when pigments which had stood so good a test as to be unfaded on the Egyptian Pyramids—where they had been applied presumably at the time of the construction of these remarkable monuments—were used, there was a greater chance of permanency than when silver, or any compound of silver, formed the pigment. He, however, unfortunately omitted to mention how the purchasers of a 'carbon print' was to know whether the pigment used in its preparation was, or was not, one which had stood the test of time in the Pyramids of Egypt. And so the discussion rolled on, and, in fact, is rolling on at the time when I write this, no definite result having been as yet attained, although A. P. Laurie, B.Sc., and H. J. Gifford promise to do something very conclusive by experiments now in progress.

I have myself carefully kept out of this controversy, because to throw any light on the subject under discussion requires at least one of two things—either a profound knowledge of chemistry, or the capacity to cast one's self, not 'into the middle of next week,' but into the middle of next century, and I am possessed neither of the profound knowledge nor of the magical capacity.

But there is a small point in connexion with a process of printing which is not, I think, beyond my capacity, and on which I have formed certain opinions, and I wish to take the opportunity, whilst the attention of photographers is directed towards a consideration of the permanency of prints, or of their lack of permanency, to emphasise my opinions.

It is a very humble department of the great art photographic that I wish to call attention to—I mean printing on our old friend albumenised paper. I call him our old friend because it seems so impossible to get on altogether without him. Times out of number it has been decreed that he shall be banished the country, but still we have him with us, and, to drop the metaphoric style which is perhaps out of place in treating of photographic matters, I believe that, in spite of its many rivals, albumenised paper is produced on a larger scale at the present time than it ever has been since it was first used.

I have nothing new to say about it, but I wish to emphasise the importance of a due appreciation of a fact that has been known for at least thirty years. This is the influence which the amount of gold in the image has on the permanence of a print.

To emphasise the fact that the larger the proportion of gold in the image as compared with silver compound, the more permanent the print, is surely unnecessary. This is admitted by all; but the evident corollary from this fact appears to be all but disregarded. This corollary is that those modifications which tend to increase the amount of gold actually used in the toning operations—imparted to the image, that is—are desirable modifications, and the practical deduction from this is, as I have already pointed out in the pages of The British Journal of Photography, and as others have probably pointed out, that we should seek for papers and toning baths which result in the deposition of the greatest possible quantity of gold in or on the image in place of seeking for those which deposit the least possible quantity as is, I am sorry to say, the common practice at present.

As pointed out by the Editors of THE BRITISH JOURNAL OF PHOTOGRAPHY some time ago, the first condition for the consumption of a large quantity of gold in the toning operation is the obtaining of a vigorous print. With a print lacking in any depth of shadow it is impossible by any treatment to get an image containing a large proportion of gold, and at the same time of a pleasing colour.

To get a vigorous print, of course the first condition is to get a vigorous negative. Without this no modification of the albumenised paper will result in a really vigorous print; but even granted the vigorous negative, something more is wanted, and that is, that an albumenised paper, fairly strongly salted, be floated on a strong silver bath. I do not believe that baths of the extraordinary strength—I think even as high as twenty-five per cent. of silver nitrate—once recommended are at all necessary, but certainly a bath containing less silver nitrate than forty grains to the ounce should never be used, and it is probably best not to let the strength go below fifty grains. In purchasing 'ready sensitised' paper the purchaser should demand a guarantee that the strength of the bath used in sensitising the paper is not allowed to fall below that mentioned. Several well-known houses are willing to give such a guarantee.

It is probable that, on the whole, 'ready sensitised' papers use up more gold in the toning operations than papers sensitised on a plain neutral solution of silver nitrate. This, of course, is in their favour according to the principles above enunciated; but my experience is, that the difference of amount used by the two kinds of papers is very much exaggerated. Ready sensitised paper tones much more slowly than what I shall call 'home-made paper' to save space, or it requires a much more concentrated solution of gold chloride to tone in the same space of time, but I am of opinion that it actually takes up very little more gold. It is undoubtedly the fact that certain brands, both of albumenised paper sensitised at home and of 'ready sensitised' paper, require much more gold to tone them than do others, and I advise the photographer to purchase that brand which experience shows will take up the most gold.

Then the question comes, How are we to tone so as to deposit the maximum amount of gold on the image? It is commonly supposed that the colour of the image may be taken as a gauge of the amount of gold that has been deposited, and this is so far true that, if toning be carried on till the deepest purple is reached, there is probably, whatever toning formula has been used, so long as it is an alkaline formula, as much gold in the image as it is possible to get there accompanied by a pleasing colour. But two facts must not be left out of consideration in this connexion. Firstly, with many brands of ready sensitised paper, and even with some brands of paper sensitised at home, it is not possible to tone to the deepest purple, the result of an attempt to do so being a mealy, slaty colour most unpleasing; and, secondly, if proper precautions be taken, it is generally possible to get a brown tone with as large a proportion of gold in the image as that in a purple image. The brown colour thus got is always particularly rich, and is generally more easily got on ready sensitised paper than on home-made paper.

Of getting the purple tone I need say but little, as the various precautions necessary are pretty well known. It is advisable, in the case of home-made paper, not to wash out the last trace of silver nitrate before toning. In the case of ready sensitised paper, it is advisable to wash in four or five waters, and to add about one ounce of carbonate of soda (washing soda) to each gallon of the third water; but even with this precaution it is not possible to get purple tones with all, or, in fact, the majority of ready sensitised papers.

The alternative with such papers as will not tone to the purple—the assumption being that it is desired to introduce as much gold as possible in the image—is to throw down the gold in the red form in place of in the purple form, the red form of gold being, I believe, in a finer state of division than the purple form.

Various toning formulæ differ slightly in their tendency to throw down purple or red gold; but, in my experience, the treatment of the print before it enters the toning bath has enormously more influence on the colour reached than the composition of the toning bath.

To ensure the deposition of the red form of gold, the first condition, so far as I have been able to investigate the matter, is that all the free silver nitrate, or very nearly all, be eliminated before toning begins. This elimination may be brought about by very long washing; but the amount of washing necessary is very great—much greater than would be imagined by any one who has not actually tried it. Another and a simpler method is to decompose the silver nitrate by the aid of common salt. After two or three washings the prints are treated with a solution of chloride of sodium of the strength of a few ounces to the gallon. After they have remained in this solution for some minutes they are washed in a few more waters and then toning is commenced. The toning bath should not be very strong. I do not think it matters very much what formula is used, but I have been most uniformly successful when using ninety grains of borax to each ounce of gold chloride.

The prints as they come from the salt bath are of course very red, and it is quite possible to perceive the change of colour when they become brown. If the toning bath be made up to a strength of, say, one grain of chloride of gold to ten ounces of water, toning will probably take about half an hour.

The prints must be fixed in a hypo bath rendered distinctly alkaline.

Prints prepared as I have described will suffer scarcely perceptible bleaching in a solution of bichloride of mercury, that is to say, there is enough gold to give the full strength to the image. It is inconceivable to me that they should fade in the sense of the image bleaching, but, of course, whether they fade in the sense of a yellowing of the lights is another thing.

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THE TRIALS OF AN AMATEUR PHOTOGRAPHER'S WIFE.

By A. F. L.

'CHARMING! How delightful to have a husband who photographs!' So exclaim my friends when I show them, with wifely pride, some of the countless photographs of every degree and kind taken by my husband—

views done in India, Ceylon, Gibraltar, Egypt, and in some of the sweetest scenery in Ireland and England; studies of dogs, horses, sheep, camels, cows; of regiments on parade, of companies of soldiers (seated with mathematical precision, officers evenly distributed); groups of all kinds, from aborigines of Ceylon to those of amateur theatricals; and last, but not least, more or less unflattering examples of home portraiture. And when my friends learn that he not only took a silver medal at a recent amateur photographic exhibition, but can also make his own cameras and almost every appliance connected with the art, they express more admiration and felicitations on my possession of a husband ‘so clever, with such a delightful hobby!’

Yes, it is a very charming pursuit, but there *are* drawbacks to it! It is expensive to start and expensive to keep up even on a moderate scale, especially in military life, when one is moved about at uncertain intervals, and without the least consideration for one's wishes or convenience. It is no joke *then*, the packing of those countless and precious bottles, the piles of glass negatives, the endless array of shutters, lenses, cameras, slides, changing boxes, drying boxes, frames, racks, baths, tanks, lead-lined sinks, and all the innumerable fragile and costly paraphernalia of a ‘dark room,’ not to mention several hundredweight of books, magazines, and notes, all connected with *the* subject! I will not say anything about such light and airy trifles as a large lathe, a carpenter's bench and grindstone, and some hundreds of tools, because these do not strictly belong to the photographic art, though, in *our* case, they are all entirely used for the manufacture or alteration of photographic apparatus. Thank goodness! *I* am not counted worthy to have a finger in the packing of all these; and for once I am content (though disparaged) to ‘lay low, and say nuffin’’ like ‘Tar Baby.’ But one thing I do know is that I get all the less help in *my* arrangements because of those many precious cases.

We will draw a veil over those ‘black’ days of packing, haunted with remembrances of fatigue and discomfort and a general sense of straw and litter. We will suppose the ‘flitting’ is over (perhaps it is already the second that year, though we are *occasionally* left in peace for two or even three years in one place). Well, now we look about for lodgings or house in our new quarters. House hunting is always wearying and disappointing, and I need not enlarge on its too familiar trials; suffice it to say that in *our* case a suitable dark room and a workshop *must* be provided, however small the space for other needs—so have I seen visions of a nice, empty, sunny playroom for the children, or a spare room, or a morning-room for myself, ruthlessly demolished by the invasion of camera and tank, &c. Forthwith begins again the erection of a specially contrived window, shutter, an ingenious affair with sliding panes of various coloured glass made to fit the window (and, of course, it will *not* fit in the next house). The plumber is called in to arrange a waste pipe, and all sorts of new ideas in fittings are erected. If that were all! But my chief grievance is that the tide of invasion is always overflowing into the other rooms, notwithstanding the two already given up. The bookcases are filled with scientific and photographic volumes; piles of magazines and circulars accumulate everywhere; stray tools, specimen negatives, half-dried prints in huge sheets of blotting-paper, litter every available corner of the sitting-rooms; the windows have an array of printing frames, so that I cannot always open or shut them when I wish (and I *must* remember to turn the right frames down at the right moment and *not* to peep at and spoil the print). Even the bath-room is invaded by washing and toning dishes, and the family medicine chest requisitioned for castor oil for the last new nasty process. I do make a periodical sweep and desperately 'tidy up' everything, but my task is never ending, like that of Sisyphus. Then I have often found the claims of etiquette and society overridden by those of an interesting new experiment in emulsions, and the coating of a batch of dry plates more attractive than hot soup!

The joys of 'home portraiture' are not always either so obvious to me. I do not object to have my portrait taken when I have on a nice, well-fitting dress, and am conscious of looking my best; but I *do* object to be suddenly called on to be a target for photographic 'shots' just when Baby has rumpled my hair and collar, and I have on my oldest work-a-day gown, and I must go *at once*, and not wait to change or tidy, or the light will be gone, and 'it's only to try a plate, not to print from,' and so on; but if the negative happen to be photographically successful, I *have* known a print shown—merely by way of a specimen, you know—to some male friend, and a nice guy he must have thought me! Then it *does* seem to me that the light is always best just when Baby is asleep in bed, or has fallen and bruised or scratched herself, or is otherwise 'unready;' and *vice versâ*, with the perversity of inanimate things, conditions are all wrong for success when the bairns are all ready to make a lovely picture. And so on.

My list of trials is yet not complete, but I think I have said more than enough to prove my case, and I hope to enlist some sympathy for my woes and those of my fellow-martyr wives. But I will own to *some* consolations. One may possibly have a little too much of such a 'good thing' as photography, but men are all the better for having some hobbies to ride, particularly an innocent and intellectual one like photography, and there are many wives who would thankfully prefer its little inconveniences to the graver drawbacks of many other pursuits that men will indulge in. And when I look through our many interesting *souvenirs* of pretty places, pleasant friends, and happy days gone by, I feel more than rewarded for any small sacrifices I may have been called on to make, and I remind myself that, after all, '*ars longa, vita brevis est.*'

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ARTIFICIAL LIGHTING.

By George Mason.

'There is nothing new under the sun.' Whatever I have to say on the subject that heads this paper has in all likelihood been conveyed to you in some shape or form before, so that it simply resolves itself into what has been, what now is, or, to come to my intention, make a few suggestions regarding the might be of artificial lighting in the future.

As far back as 1861, there flourished in the immediate neighbourhood of Covent Garden, London, a studio where it was announced that photographic portraits were taken every night by electric light—twenty years before Vanderweyde; but then it was not true. They made pictures certainly, but the apparatus used was Moule's photogenic lamp. This pyrotechnic lamp was, I believe, the first commercially used light for photography, and it did good work in its day. All the firework, compound-burning lamps sprung from this one of Moule's, additions and improvements being introduced, and many of these are in use every winter now, as the dark weather comes round, and results are produced by them second only to electric lighting. And for the benefit of those who do this work, I here note the composition of a powder then used, when positives only were taken, and hence a good light was absolutely necessary:—

Pure and well dried nitrate of potash	3000 parts.
Flour of sulphur	1000 ,,
Powdered sulphuret of antimony	200 ,,
Powdered red orpiment	400 ,,

The whole to be well mixed and passed through a sieve.

The principal detriment to the use of all pyrotechnic lights is the excessive quantity of fumes and smoke that they give off during combustion. Owing to this cause the lamp must be made a fixture, and a chimney fitted for the purpose of carrying these fumes away. But could the light be produced without this defect, as an illuminating power for photographic use it would hold its own against the electric light, for the light itself, being a broad, intense flame, it at once fills the studio with a bright, diffused light, an effect that is so difficult to get from a light where the source is a pointed speck and the diffusion of which has to be obtained from reflectors and appliances.

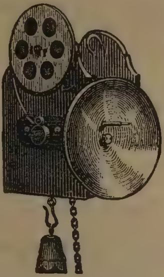
In these notes I wish to say a word or two in favour of magnesium lighting, for now that the cost of the metal has been reduced to about one-fifth of its original price, there should be an opening for its extended use in this field of photographic art.

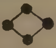
In conjunction with Mr. Robert Turnbull, Glasgow (a gentleman who has had great practical experience in all the various modes of lighting the sitter by artificial means), I made some experiments in negative taking by magnesium light, and the results were such as to lead me to believe in a successful issue.

The same difficulties that electric lighting has to contend against to some extent also attend magnesium, viz., the original source of light is condensed or pointed, and not a broad flame like the pyrotechnic lamp, hence the pointed light has a tendency to illuminate in circles and give shadows here and there, unless diffused and broadened out, so to speak. In using the electric light, the effect desired is produced by throwing the light of the spark itself on to a reflector, so placed that it sends it back on to the surface of another large reflector which is the illuminating power used to photograph by, so that the first or source of light must of necessity be very brilliant and intense as much of it is absorbed and lost in transition.

In using magnesium, as stated, the light has the same concentrated effect, so that this is the first thing to be corrected. It can be diffused by taking it far enough back from the sitter, but the loss of illuminating power becomes so great as to render it comparatively valueless.

In our experiments we took negatives in from fifteen to thirty seconds, using the lamps No. 1 and 2 (see cuts). The No. 1 lamp is fitted with clockwork and arranged to hold as much magnesium ribbon as will last during two hours of constant burning. Two of these lamps were arranged on stands at different heights, so that the one broke into the circle of light made by the other, and by this means illuminating and dispersing the shadows made by them when burnt singly. In front of these we had a screen of mineral oiled paper to further diffuse the light. The small lamp, No. 2, was, during exposure, moved backwards and forward on the shadow side of the face to light it up, and with these three lamps we got a fully exposed negative in fifteen seconds.



Mr. Turnbull thought that if the two stationary lamps oscillated gently during exposure that it would improve the softness of the picture greatly. He also proposes to do away with the two lamps and substitute one with four strands of magnesium ribbon coming out from the centre of a large reflector, say fifteen inches diameter. These strands of magnesium being placed at a distance of one and a half or two inches apart, in the form of a diamond, so , the brilliancy of these combined lights and the dispersion of them caused by the size of the reflector would allow the apparatus to be moved further from the sitter, and by this means produce a softer picture all over.

I am having a four-strand lamp constructed now, the test results of which must be left for some future communication.

There are some fumes thrown from the magnesium ribbon as it burns —nothing to talk of in quantity, still, sufficient to be provided for if you want to keep your studio clear during work. A funnel over the lamp to catch them as they rise, with a flexible tube attached to pass out into the open, is an arrangement that could easily be made.

We worked close to an open window in the studio during our experiments.

WESTMINSTER ABBEY.

By G. T. Grammer.

To residents in or near London it may be useful to know how to obtain permission to photograph in and about the Abbey.

In the first place, apply to the Chapter Clerk at the Sanctuary, Westminster Abbey, and he will hand you a printed form of certificate to be signed by a clergyman, Member of Parliament, or barrister, &c., and when this is done it is to be taken to the Chapter Clerk, who gives in exchange a card signed by the Dean authorising the holder 'to make drawings in the Abbey for twelve months from the date.' It is renewable at the end of that time.

It is advisable to photograph there in the spring, as most of the important subjects have to be taken in the afternoon. I omitted to state the permit has to be countersigned by the Clerk of the Works.

The permit allows access to all the chapels, and, I understood, even when closed to the general public.

There is no need to dilate on the subjects to be found in the Abbey. On entering from the inner court of Westminster School one comes to the cloisters, which are a fitting commencement for the artist. Amongst the many monuments, &c., I may call attention to the very beautiful one (both in conception and modelling) of Joseph Gascoigne Nightingale and his lady by Roubiliac.

Washington Irving in his *Sketch-Book* writes:—'The bottom of the monument is represented as throwing open its marble doors and a sheeted skeleton is starting forth. The shroud is falling from his fleshless frame as he launches his dart at his victim. She is sinking into her affrighted husband's arms, who strives, with vain and frantic effort, to avert the blow. The whole is executed with terrible truth and spirit; we almost fancy we hear the gibbering yell of triumph bursting from the distended jaws of the spectre.' The whole sketch, 'Westminster Abbey,' is well worth perusing before visiting the Abbey. The monument alluded to is in the Chapels of St. John the Evangelist, St. Andrew, and St. Michael.

ANOTHER PLAN OF PRODUCING PEDESTAL PORTRAITS.

By W. M. Ashman.

About three years ago I had the misfortune to select the same topic for the Almanac as that adopted by another contributor. The probable reason why each chose the same subject was on account of its appearance about that time at one of our Society meetings, when both took part in the discussion. To avoid a second collision of like nature, another source of information has been used as a prompter upon this occasion, viz., the columns of The British Journal of Photography. On page 106 of the current volume, L. C. Meves describes a method of producing pedestal portraits by means of a suitably constructed painted screen. This plan may be very good, but, not having tried it, am unable to offer an opinion on its merits. There is another way open to silver printers, however, which is available for realising many happy effects in portraiture, and that is combination printing, or the combining of portions from one negative with the whole or parts of others.

To produce pedestal portraits in the manner hinted at, a very small outlay of time and money is necessary; it being merely requisite to obtain the base and pillar of a sculptor's pedestal in moulders' plaster, and all the rest is easy. Even marbling the same with Indian ink and a touching-out brush is not difficult if desired. It is well to place such a pedestal a few feet in front of a very dark background (cheap unglazed black cloth or velvet answers), and illuminate it from the same source as the intended portrait will be lit. Then photograph to secure a good quick-printing negative, P. In professional practice it would be better to make a stock of negatives, varying in size and style of lighting, in order to have a selection always at hand. The next step is to cut a mask representing the pedestal, which may be most conveniently done by printing on sensitised paper and removing the surroundings by means of a sharp knife. We will term this mask P P.

We now pass to the sitter, who must of necessity be arranged about the shoulders in folds of lace or other light drapery. The hair of the head, eyebrows, whiskers (if any), require to be well covered with toilet powder, and a moderate application of this substance to the skin is more beneficial than otherwise. The black background before mentioned is again utilised, and a moderately well or slightly over-exposed negative, B, should be produced.

To dispose of that part of the figure situated below what may be termed the bust line is the next point to receive attention, and that is managed in the following way:—Let the negative, B, be moderately dry, but not chippy, and unvarnished; then, with a needle point, lancet, or other sharp edge, cut a line through that portion of the bust where it is decided to terminate the figure, and scrape away all the film below that point when the negative is ready for varnishing. Japanners' gold size and benzole in equal parts, applied cold, forms the most satisfactory varnish for gelatine negatives that the writer has yet met with, and it offers considerable facility for retouching on. A mask of the portrait B is next made, which we will term B B. The rest is simplicity itself. Adjust mask P P on negative B, so that the upper portion touches the base of figure. Print as usual, but not too heavy. This gives the portrait on a black ground with a blank white space for pedestal. Next readjust the print over negative P, at the same time protecting the portrait with mask B B. When printed a pedestal print will result. There is no difficulty at all about the operation, and it could be simplified somewhat by the employment of a flexible pedestal negative.

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PRESERVING PYROGALLIC ACID IN SOLUTION.

By J. T. Hackett.

Last year I mixed up two solutions of pyrogallic acid according to Messrs. Wratten & Wainwright's formulæ, in order to test their keeping qualities, and found they kept in good working order for at least eight months. Although neither solution remained colourless, they did not stain the film unless the same solution were used for developing more than one plate; but if a little staining is not objected to, three or four plates can be developed in the same solution, but it is best not, unless the plates have been over exposed. The stain can be removed by any of the usual methods if thought desirable. The formulæ stand thus:—

No. 1.

Pyrogallic acid	1 ounce.
Citric acid	30 grains.
Distilled water, to make	10 ounces.

No. 2.

Pyrogallic acid	1 ounce.
Sulphurous acid	30 minims.
Distilled water, to make	10 ounces.

No doubt larger quantities of the preservative acid would keep the solutions of pyro perfectly clear for an almost unlimited period, but it must be borne in mind the larger the quantity of acid used to keep the pyro more ammonia and less bromide will be required in the developer, as the combined action of the preservative acid and the ammonia tend to prevent fog.

The above quantities or kinds of acids may not be the best that can be used, but they both answer very well, in fact neither acid seems to have any advantage over the other.

It will be observed that the foregoing are 10 per cent. solutions; and, by-the-by, it is a very good plan to make similar solutions of the bromide and ammonia (as recommended by Mr. Burton and others), as then any brand of plate can be developed with them without mixing up separate developers for them, or the developer can be modified in a moment to suit any particular subject. But if the full advantages of the 10 per cent. solution method is to be obtained, each of the three solutions must be kept in the new (or any other) stoppered dropping bottles, as they save waste when measuring out the quantities required. A 60 minims or 120 minims graduated glass measure will also be found useful, and one or two 4 ounces or larger graduated glass measures a necessity; an American sand-glass,* fitted with adjusting bar and bell for one minute up to (I think it is) five minutes, will be useful for timing the development. The sizes of the measures and the quantities of the solutions mixed must be settled by the photographer himself, as the sizes and quantities of the plates to be developed will govern this.

Now with regard to the method of development, so many different opinions exist that it is very seldom, if ever, that two photographers will use exactly the same formula, or use it like any other. Some say quick development give the best results, and others, slow; the latter seems to me to be the safest if it is not always the best. I consider five minutes quick enough, and thirty minutes slow enough, for almost any subject or plate; but ten minutes will generally be quite long enough if the exposure has been anything near the mark, and for studio work it will be found ample, a shorter time being rather an advantage than otherwise.

Respecting the formulæ issued by most dry plate manufacturers, I have generally found that the proportions of each chemical used in the developer is much larger than is necessary for most subjects, especially studio work.

At some future time I hope to be able to lay before my readers a detailed account of experiments with different developers.

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HOW TO WASH PRINTS: A WRINKLE FOR AMATEURS.

By H. W. Hollis, F.R.A.S.

I have met with difficulties of all sorts since, thirty years ago, I took a picture on a silvered plate with a camera made of a cigar-box and one of the lenses of my father's telescope, but my *bête noir* has ever been—until I hit upon the little dodge I am about to describe—the final washing of my prints. I have suffered with washers of all kinds, I think—revolving washers, rocking washers, dashing washers, sprinkling washers, floating washers—including, of course, that abomination of abominations, a deep, round vessel with a syphon, and half a dozen of the more costly modern appliances—the leading idea in all of them being to keep the prints in motion and constantly change the water. I have always found my prints from time to time floating dry on the water, sticking to the bottom, sticking to the sides, sticking to each other, jammed into the corners, screwed into the outlet, torn across the middle, creased, doubled up, perforated, stained, dirtied, destroyed. But my troubles are ended.

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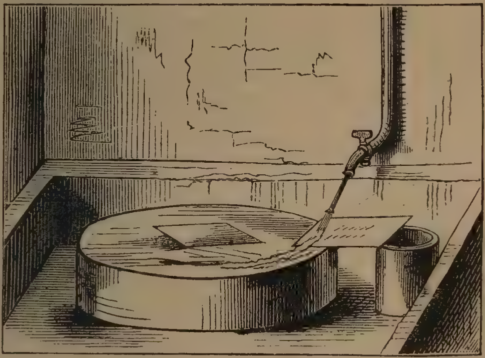
* Price 1s. each at any of the American Novelty Stores.

I have a circular dish of white glazed earthenware—zinc would do as well, and be cheaper—fifteen inches diameter, and three inches deep. I place this truly level in my sink, so that when filled to overflowing the water will creep over all round. If the dish be tilted so that the water flows over all in one place, some wretched print accidentally floating for a moment at the top will be enticed to put one of its corners over the edge in the outgoing stream, and there it will be delighted to stick. I place a glass plate horizontally on the edge of the dish, so that one corner of it just touches the water, but does not dip below the surface. I then direct a very small stream of water, with considerable velocity, in such a manner as to strike the plate within a quarter of an inch of its edge at an angle of 45°, and then dart along the surface of the water in the dish close to the side, and at a right angle to the diameter of the dish. I put in the prints face downward, open the tap to just the right amount, and the result is such as to fill the mind of the amateur with an inward peace. The prints remain suspended in mid-water; never float on the top, never stick to the bottom, never exhibit any undue affection for each other, but remain, if desired, for hours and hours gently revolving and quietly moving about amongst themselves. I obtain the sort of stream required by sticking into my tap a piece of 'composition' gas-pipe, with the lower end pinched



together so as to give a very narrow orifice. The above sketch shows clearly the whole arrangement, which I heartily commend to all whose print washing is upon the ordinary scale of amateur practice.

EXPERIMENTS WITH EOSINE.

By J. Werge.

No one can be more alive to the desirability of a *true* translation of colour by photography than I am, and with that object in view I have recently made some experiments with eosine, and will now endeavour to describe the results. It has been stated that eosine is the best colouring matter to employ, and that the best mode of eosinising plates is to immerse an ordinary gelatino-bromide plate in a solution of eosine, and on those lines I worked.

Imprimis. I constructed a scale of colours, not *a la spectrum*, but in relation to their light and shade for artistic translation, and that I placed before the camera.

Secondly. I immersed a good working gelatino-bromide plate in a ten grain per ounce solution of eosine for about fifteen minutes, so as to get the film dyed right through, and a beautiful colour it was when I saw it in daylight.

Thirdly. After draining, I exposed the eosine plate in the camera, on the scale of colours for thirty seconds. Result after development, greatly under exposed; blue showing most; orange and green showing less, but about equal; yellow showing a little better, but not sufficiently; red and black showing least, or not at all, both equally free from deposit.

Fourthly. I immersed another plate in a five grain per ounce solution of eosine, and exposed on the same subject the same time as before, under the same conditions. Result, about double the intensity of the former, and about the same degree of translation.

Fifthly. I exposed a simple bromide plate on the same subject, same time, and same conditions. Result, infinitely better density, but this time green and *yellow* about equal; red less than black; and blue *much* the strongest.

Sixthly. After immersion in a five grain per ounce solution of eosine, I exposed on the same subject for *five minutes*. Result, a better negative; yellow stronger than green, but not so strong as blue; green and orange about equal; black and red clear and unchanged.

Seventhly. A plain bromide plate was exposed on same subject *five minutes* under same conditions. Result, much the best negative; yellow stronger, but not equal to blue; green and orange lighter than yellow, and equal; red and black slight deposit, but about equal.

Conclusions.—The above results show that eosine has very little effect in helping to translate yellow, none on the red, green, or black; that it does not retard the activity of the blue, relatively, but that it does retard the action of all, for the simple bromide plate was in both times of exposure decidedly the best negative both as to density and translation. A true translation of colour is not to be obtained by the help of eosine alone. A maltranslation is increased by under exposure.

Moral.—Let every one who experiments in this direction publish his results, whether successful or otherwise, in the true spirit of mutual help and in the spirit of the pioneers of photography. By doing so the time of others will be saved, and by experimenting in other directions some one may stumble on the right thing, and if photographic translation of colour is not made perfect it may soon be made better for the benefit of all, and art in particular.

P.S.—I shall be pleased to show the negatives alluded to in the above to any one who wishes to see them.

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ARTISTIC PRINT MOUNTING.

By John W. Leigh.

Looking through an album of photographic prints one is struck with the uniform squareness of the pictures, the result of a desire to utilise the whole of the negative.

Camera makers nowadays seem as if they were not able to depart from such sizes as 10 × 8, 11 × 9, 12 × 10: the old 11 × 13 size was certainly more artistic. If we lay an oval cut-out mount on some of these square prints, or cover up with a piece of paper say an inch at top and bottom, we note a very marked improvement; and I would suggest that amateurs study the shape most suited to the subject, which, usually, will not be so near a square as the sizes mentioned above. As regards mounting there is no style more artistic than plain white *plate* paper with a sunk plate mark, the same as seen in steel and copper-plate engravings. This is easily made, as follows: Trim the prints in the usual way by placing them face up on a piece of glass larger than the print; on this place the shaping plate—which is a piece of glass the size the picture is to be cut—and cut 'round' this with a sharp knife. Suppose our shaping plate to be 11½ × 8, we shall require another plate 12¼ × 8⅞; with this cut a piece of eight or ten sheet *hard* cardboard, and round off the corners with a sharp knife to the same bend given to engraving plate marks. This is our 'plate' for making the 'sunk in.'

Having fastened the print to its mount, lay on it the 12¼ × 8⅞ glass plate in such a position that it overlaps the print at the top and sides three-eighths of an inch, and at the bottom half an inch; with a black-lead pencil mark the mount, so that the 12¼ × 8⅞ *cardboard* may be placed in the exact position occupied by the glass; now carefully place the mounted print and cardboard under a copying-press of the kind usually used in office work, and screw down tight as possible. If the press is not very powerful, place two or three thicknesses of felt or blanket on the bed. Plate marking done in this way is quite equal to that done by printers with expensive machinery and metal plates.

If a screw-press is not at hand, a substitute is a joiner's bench screw, and two well planed sycamore boards, using the felt or blanket pads; but this requires two pairs of hands. It will be observed that the plate mark is rather wider at the bottom than the sides and top of the picture; in mounting prints for framing the rule is that the margins at the top and sides are equal, and at the bottom somewhat wider; this gives the picture the appearance of standing upon something.

As regards the artistic trimming of prints, I think all pictures where motion is intended should have a greater space in the direction the object is supposed to be moving than that which it has left; for example, an instantaneous photograph of a ship should have more space at the bows than the stern, so giving the idea of *going to* rather than *coming from.*

BLISTERS.

By Thomas Kane (Brooklyn, N.Y.).

In the British Journal Photographic Almanac for 1885 (page 92) Mr. Sutton says, ‘One of the crying evils in modern photographic operations is the blistering of albumenised paper,’ and further on in his article he states ‘that blisters on albumenised paper are of three different kinds.’

For a while I was very much annoyed with the blistering of albumenised paper, and with a view of obviating the difficulty I decided to investigate the subject. Some of my conclusions will be found embodied in an article which I contributed to the Almanac for 1883 (page 179). A few words supplementary to that article may not be amiss now.

My investigations led me to infer that photographic blisters were composed of gas generated, perhaps, by the decomposing action of sulphide of silver on water. Prints are permitted to remain a longer or shorter time in the preliminary wash waters, which contain more or less free silver from the prints, and this free silver probably permeates the paper and lodges between it and the albumen film until it is brought in contact with some sulphur compound, either in the toning or fixing bath, where sulphide of silver probably is formed, which (when the prints are transferred from the fixing bath to water) decomposes the water into its elements and combines with the disengaged hydrogen to form sulphuretted hydrogen, thus producing the photographic blister. Acting on that theory, I have got rid of photographic blisters by using plenty of water for the preliminary washings, never allowing the water to become strong in silver, and passing the prints as rapidly as possible through these preliminary waters; next, using no more alkali in the toning bath than is actually necessary to effectually complete toning; and, finally, transferring the prints from the fixing bath to a strong solution of salt and water, then reducing *very gradually* the saline strength of this last solution, carefully observing at each addition of fresh water that none of it shall fall directly on the prints, but shall be thoroughly incorporated with the solution before reaching them. This mode of procedure has freed me from blisters.

Mr. Sutton thinks that there are ‘three kinds’ of blisters. I infer that the chemical composition of all photographic blisters is the same.

Mr. Sutton found that the addition of ammonia to the hypo bath ‘an effectual and perfect preventative’ of some blisters. Regnault's *Elements of Chemistry*, vol. ii., page 299, Baird's edition, Philadelphia, U.S., 1867, says, ‘Sulphate of silver . . . . readily dissolves in ammonia.’ By the use of ammonia it appears to me that Mr. Sutton eliminated some sulphur compound of silver, and so was rid of his trouble. This seems to lend some probability to the theory upon which I am reasoning concerning blisters. Whether ammonia would be likely to dissolve the albumen is a question for consideration. Mr. Sutton found that salt was the only preventative of the third and most formidable kind of blisters, though he did not succeed so well with it on the first and second kinds. Salt is good for all, and its preventative action is based on chemical laws. Regnault (pages 203–4, vol. i.) says that ammonia, chlorine, and alcohol are antidotes for sulphuretted hydrogen gas. Again (page 300, vol. ii.), strong boiling hydrochloric acid decomposes sulphide of silver. Blisters arise from careless manipulation, and can very easily be prevented. I do not put any preventative in either toning or fixing bath, but use a separate solution of salt and water. But you can use salt and still have plenty of blisters. Pay particular attention to preliminary washing and *gradual* reduction of salt solution at last washing.

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PHARYNGITIS AND PHOTOGRAPHY.

By P. H. Emerson, B.A., M.B. (Cantab.).

The pharynx, or what is popularly called the back of the throat, is full of small glands, whose work it is to keep the throat moist. These glands are liable to chronic inflammation of two kinds, one in which the structures become enlarged, and the other in which the glands become blocked by an inspissated secretion. This inflammation is popularly called 'clergyman's sore throat,' because it is often the effect of using the voice a great deal, and for that reason we find it common in singers and public speakers. Exposure to cold, tobacco smoking, and alcohol drinking will also cause it. The symptoms are a stiffness and dryness of the throat, causing the patient to 'hawk' and try to clear his throat, especially in the morning. When in a crowded room full of tobacco smoke the patient often feels a choking sensation, due to the dryness of his mucous membranes. He complains his cough hurts him, and there is a soreness felt just above what is called 'Adam's apple.' Moreover, he often feels as though there were a dry patch in his throat, and he takes some liquid to clear his throat. The patient often suffers from hoarseness. If the patient will take a small mirror, and stand with his back to a window, holding the mirror before his widely opened mouth, the light will be reflected into his throat, and he will clearly see the pharynx and be able to see whether the mucous membranes are smooth and healthy or studded here and there with small red granular growths the size of small seeds, joined by dark veins, or with whitish looking patches the size also of small seeds.

Now it is my belief from my own experience, and that of some others, that photographers are especially liable to this disease, and if such is the case it is due, in my opinion, to the irritative fumes of ammonia given off from the developer. With a view to clearing up this point I shall deem it a great favour if every reader of the year-book—amateur and professional, sufferer or non-sufferer—will take the slight trouble to fill in the answers to the questions given below and forward me at their earliest convenience. For if ammonia has this baneful effect it is time we knew it, and took means to combat it. All communications will be treated as *strictly private* as regards the name of correspondent, but the author requests the name as a surety of good faith.

Details requested.—1. Age. 2. Is correspondent rheumatic or gouty? 3. Is he a smoker, singer, public speaker, or total abstainer? 4. Has he small reddish or whitish lumps in his throat, if either? 5. How long has he noticed symptoms, and how long is it since he began developing plates? 6. On an average how many hours *per diem* is he engaged in developing, and does he notice his throat worse after a spell of developing? 7. Does he use ammonia in his developer? 8. Any incidental remarks by correspondent will be gratefully received. 9. Signature.

I hope those who are constantly developing plates will write, whether they suffer or not, for negative evidence will be invaluable.

10 *Marlborough Crescent, Bedford Park, Chiswick.*

NEGATIVES FOR PHOTO-LITHOGRAPHY.

By Dr. Ed. Liesegang.

Photo-lithography is the easiest thing to do if one has a good negative, but will never give fine results if the negative is not what it ought to be —clear in the lines, opaque in the ground.

It is certainly possible to develope a good negative on a slow gelatine dry plate, but the fact is that nearly all the large establishments for photo-engraving and photo-lithography still stick to the old collodion process. The collodion must not be too thin, and have a sufficient quantity of iodide and bromide. The strontium iodide is perhaps the best to use, because it gives a good dense negative. The nitrate bath I use contains 50 grains of nitrate of silver to the ounce, and about a grain or two of iodine. I find that iodine is the best thing to make the nitrate bath acid, much better than acetic or nitric acids. The bath will work clear and good from the first plate that is sensitised in it. The ordinary iron developer (water, 1 ounce; sulphate of iron, 24 grains; acetic acid, 24 grains; alcohol, 24 grains) is good. The exposure of the plate must be rather short. For fixing I prefer hypo. The well-washed negative is whitened in a solution of 24 grains bichloride of mercury in 1 ounce of distilled water; this acts quicker in a strong daylight than in the dark. Wash well, and dip into a bath of 10 parts of water and 1 part of ammonia. As soon as the negative has become dark, wash it again, and coat it with gum water; let dry, and varnish as usual.

If one should not succeed in obtaining a good negative in this way, I would recommend the following one. Intensify the developed negative in the usual way with pyro and silver, fix it, and after washing treat it alternatively with solutions of bichromate of potash and of hypermanganate of potash, until it has become of a strong orange-yellow colour. Wash and dry. Tint the ordinary negative varnish with alcoholic solution of aniline blue. This varnish makes the ground of the negative in transparency deep black, while the lines appear blue. Such a negative will be sure to give the expected results in the transfer print.

PLATES: COMMERCIAL AND HOME-MADE.

By Rev. B. Holland.

As many photographers still experience an uncertainty in obtaining reliable plates, I would call attention to the advantage of making them at home. The method of working is so simple and the gain in quality so positive, that amateurs especially should make the manufacture of plates a practical study.

I would urge this the more emphatically because of the disappointments I have met with personally in the manipulation of commercial plates. Now and then you can buy from a batch that seems to have scarcely any faults, whilst at other times evils of all kinds appear—fogged films, fogged edges, insensitive patches, marks of thumbs and fingers all over the surface, and a host of minor troubles have to be contended with.

Now the major portion, if not all, of these difficulties may be avoided if the photographer will but carefully make his own plates. I would emphasise the word *carefully*, for, of course, without due attention to every detail, it is more easy to fail than to succeed. Given, however, the requisite knowledge and sufficient painstaking at all stages, and better plates can be made in small batches at home than can be bought.

I cannot insist on any particular formula—every man has some pet theory of his own—but I would certainly advise the preparation of small quantities of emulsion rather than large ones. Make just enough to meet present demands and devote to that amount all your knowledge and all your skill, and I am inclined to believe that many readers of these words will do as I have done—eschew bought plates altogether.

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TONING.

By Edward Dunmore.

As many amateurs may in the future be disposed to do their own printing, a word or two on toning the print may perhaps be useful. To start with, it must clearly be understood that only a good negative, so far as scale of tone is concerned, will make a good print; one of the thin, foggy abominations so prevalent will no more give a good print than an etching needle would answer for a crowbar, but given a good negative—a negative that has points of opacity for the highest light and almost clean glass for the deepest shadow—there will be no difficulty in making a good print from it. Let it be borne in mind that a negative of the soot-and-whitewash character will give *perfection* of *colour*, but as negatives of this sort are to be deprecated on all other points, it remains to get as great clearness and density as is compatible with artistic effect and all other good qualities that a good negative should possess. We will suppose we are dealing with a negative of this class and using the ready-sensitised paper. The printing is then the first consideration. A strong diffused light is the best, and the printing must be rather deeper than it is intended to remain, as it reduces somewhat in the toning and fixing. Let the print be taken out of the press and washed in plain water till there is no milkiness; a dip in weak salt water will remove the remaining free silver and after another wash in plain water, and it is ready for toning in a bath composed as below:—

Chloride of gold	1 grain.
,, calcium	4 grains.
Acetate of soda	30 ,,
Water	10 ounces.

Mix, and let stand for a day or two. The washed prints to be immersed in this and moved about until the half tones become a warm grey, then remove to a dish of plain water before fixing in a one-to-five solution of hyposulphite of soda, made slightly alkaline with carbonate of soda; twenty minutes in this, to be followed by a thorough washing, will complete the process.

Toning baths are much better freshly made than when long kept, and strengthened from time to time by the addition of gold, as is frequently the practice.

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GENERAL HINTS FROM WELL-TRIED EXPERIENCES.

By W. Harding Warner.

The Convention at Derby was a grand success: it made many who were strangers to each other acquaintances, enabling all to realise more fully that great ideas from great minds often proceed from ordinary human beings, though our imagination is apt to clothe their writings with false notions as to their *personnel*, making them appear as giants—old and tried men—when they are not so in years. Such were the thoughts of the writer on first meeting Mr. W. K. Burton, whose articles on every subject prove him to be a man of thought and wisdom—a Goliah in strength though a David in years. May he go on and prosper. And this introduces that of which he is an advocate—'Slow plates.' The fashion of the day is to be 'fast.' Bicycles, tricycles, 'Flying Dutchmen' trains, instantaneous plates, lenses, and even cameras, may be classed together, and commercial plate makers, following the fashion, not only make rapid, but extra rapid, plates, in the supposition that such must be the *sine quâ non*, the *ne plus ultra* of perfection. Now it is possible to go too fast and, as a natural consequence, to come to grief. All admit that wet plates still hold their own as negatives, and that though gelatine is a great convenience, still the work done by the one is finer than the other. Why? Because of that 'loss of rapidity,' if I may so term it, giving time for the collodion film to grasp, as it were, more comprehensively the rays of light, and those of us who aim at making artistic productions are not content with a semblance thereof.

Rapid plates, like lenses, are not suitable for all kinds of work; yet they can be slowed by using, in development, a double dose of pyro. But this is wasteful, and does not remove the evil of halation. Here, then, is a plea for 'slow plates,' and they may be made rapid and cease to give halation by knowing how to use them. 'By increase of exposure,' I hear some one suggest. No, my friend; use a rapid symmetrical, of moderately long focus, and a flap shutter cutting off the diffused rays and so making the light more direct and the plate nearly as rapid as your 'instantaneous' one, with double the amount of detail, more nearly approaching the wet plate in perfection and beauty, backing up your plate with red sheet rubber (which is not expensive), ensuring not only perfect dryness, but making the rays harmless, withal using a developer that whatever your exposure may be—long or short—so scientific is it in its character that every plate, provided it be a slow one of seven or ten times, of hard gelatine, and containing an iodide and bromide, shall be a success. For such developer the British Journal Photographic Almanac of 1886, page 199, furnishes the formula. As an independent worker the writer has used this about two years, and can thoroughly recommend it. A good wash at the tap, ten minutes in a saturated solution of alum, another good wash, then fix in fresh hypo and an hour's wash, *face down*, in one of Husband's washing cisterns, and you may be in possession of a 'thing of beauty and a joy for ever.' The above may be termed the acme of simplicity.

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NAMES FOR PICTURES.

By William Adcock.

'What's in a name?' Despite all said to the contrary, a lot. Other things being equal, Mr. Cadger would be at a disadvantage in competing with Mr. Courtney; yet the name of a person is a trifle to the name of a thing. The surname of a handsome man, with straight eyes, may be *Squint;* it gives no obliquity to his vision. He passes through life as do people with peculiar names—in most respects unaffected by it. But if we make Mr. Squint's head a model, and call the picture, 'A Squinter,' people do not see it. There is no squint about it. It is a misnomer. Nothing is more affected by naming than a picture—if happy it may make, if unsuitable it will mar. To be happy it is insufficient to be near the mark, it must be hit. Some years ago I sent a subject to your Journal and left an expert to name it. It received, *Pleased with Herself.* 'No, father,' said the lady who sat for it; 'pleased with everybody else, if he likes, but not with myself.' The name so bestowed sticks to the head to this day. 'The *Pleased*' would be a neutral and more correctly expressive title.

The approach in name of some feelings and of some passions oft leads to ill-applied titles. Grief is not sorrow, pleasure is not rapture. It would be as much out of place to use one name for the other as to call a bent head, with a sad, thoughtful face, 'A Reverie;' yet I have seen a beautiful work ruined by such a title. A sight of that work—charming in all other respects—gave me a subject for this year's Almanac, and impels me to say the better our work the greater the necessity for a good title to it. Let care as great be given to point to the sentiment in a picture as is bestowed on producing the sentiment itself.

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PROGRESS IN PHOTOGRAPHY.

By George Smith.

The advent of gelatino-bromide, from the fact of its great rapidity, is admittedly a great step forwards. Alkaline development, however, would appear to be not only a distinct misnomer but an error of direction, at any rate in our present knowledge of the properties of sensitive surfaces. If there is one conclusion more than another to be drawn from past experience it is that all the developers hitherto have been acid. In my experience I am led to conclude that the acid condition is essential to the development of gelatino-bromide. The most powerful developer I am acquainted with is ferrous oxalate, when both solutions are distinctly acid, both fully saturated, and mixed in the proportions of fully one of iron to three of oxalate. This will develope a fully exposed plate to full density within a minute, while if the plate has received about a fourth of the normal fair exposure it will still yield an almost ideally perfect negative, but take a considerable time about it. As the margins in either case develope absolutely clear glass it is a fair type of a normal developer, as I understand a developer. Potash and pyro is quite equal to it *if slightly acid.* Any acid—even pyrogallic acid in excess—appears to act as a restrainer. I therefore believe, and submit the problem for corroboration, that the amount of ammonia possible to use without causing fog is limited by the amount of acid of some kind in the developer.

My own predilections are against gelatine and in favour of collodion; no negative that I have seen will compare for a moment with pyro developed collodion, wet or dry.

Sulphite of soda deserves special attention. It has a great affinity for oxygen, and appears to use it by absorbing the oxygen from the air, thus prolonging the life of the developer. The addition of it to a ferrous-oxalate developer prolongs its developing power for an extraordinarily long period, plate after plate, with only very slightly decreasing power, judged by the time required to develope to full density.

CHANGING PLATES WHEN TRAVELLING.

By Russell Sedgfield.

Amongst the plans recommended to travelling photographers who find themselves without a lamp for changing their plates, are to get under the bed or creep inside the bed-clothes in default of being able to find a dark cellar or cupboard, and work by feel. This summer, finding myself in such a fix, I simply placed the bedroom candle behind the looking-glass, so guarding against too strong reflection from the ceiling, and proceeded to change the plates at the other end of the room, finding quite enough light for the purpose.

When I add that some of the plates were Wratten's drop shutter, and that there were no ill effects from the light, it will be seen that the thing is simple enough.

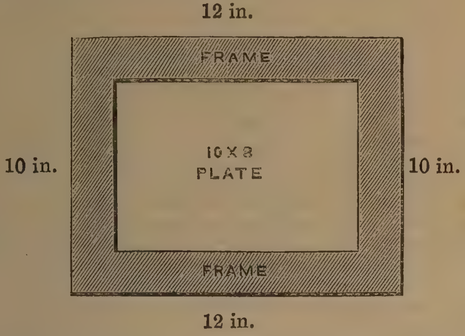
The principle is probably not new to any experienced travelling photographer, but may be so to some of the rising generation.

DRY PLATE PACKING FOR TRAVELLING.

By George Bankart.

The following method of packing sensitive plates *for travelling* has had more than a year's trial at my hands, and having proved perfectly successful and very convenient, perhaps the details may suit a corner in your Almanac for 1887. This method may have been thought of by others, but I have not seen it mentioned in any photographic publication.

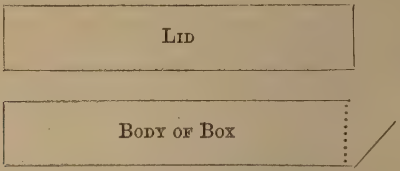
The chief considerations for carriage of plates on a journey seem to be compactness of stowage, safety of the film from injury, and freedom from creation of dust by friction, all of which are secured by the following method :—Procure some *very stout* cardboard, such as might be used for 'cut-out mounts' for framing pictures or photographs. It should be equal in thickness to the average of glass plates used for negative films, sooner a shade thicker than thinner. Cut it into exactly rectangular pieces one and a half or two inches larger each way than the glass plates to be used (say for 10 × 8 size cut 12 × 10). Cut these again into 'open mount' forms, one-eighth of an inch larger than the plates, leaving a frame of cardboard into which a 10 × 8 plate will fit *easily*, and leave a card margin all round it of about one inch in breadth.



Next procure some of the stoutest white unsized paper, such as is used for the 'books' for carrying plates made by Sands & Hunter. It is sold by Mr. H. Silverlock, 92 Blackfriars Road, London, S.E., and is guaranteed free from all chemical matter likely to be injurious to gelatino-bromide films, which I believe to be correct, as I have not experienced the slightest detrimental effect after storing plates in contact with this paper for weeks or months.

Lay a half sheet of this paper on a flat table surface with the *smoothest side upwards.* Spread hot glue over *one side* of the *cardboard frame*, and place it on the unsized paper. Rub it into close contact, and leave it under a flat board or glass plate *under pressure* until set quite hard. Trim off the outside edges with a sharp knife, and you have a flat, shallow tray or cell, the sides of stiff cardboard, and the bottom of smooth, white, bibulous paper. Make any number of these you may fancy for convenience, and lay them on each other; the outer edges should be cut so as to coincide accurately, and form a smooth-sided compact mass when piled up in quantity. For my own use I have eighteen in number, as I can then unpack two boxes (maker's dozens), put eighteen into these 'carriers,' and the other six into my three double dark slides. I prefer to carry my 'general stock' of plates in the maker's boxes (as bought) until shortly before they are required for exchange for exposed ones, always stowing them edgeways in the packing-cases.

The plates must be well dusted with a broad camel-hair brush, and laid *face downwards*, one in each cell or carrier (previously also well dusted). A cardboard box must now be made (from the same cardboard) of such inside dimensions as will exactly take in the parcel of 'carriers' *with the least possible shake*, and for convenience in getting at the carriers with the fingers one end should be hinged with cloth so as to fall down when the lid is removed.



Each carrier with its plate enclosed lies flat on the top of another, and the whole eighteen (or more) form a compact mass, which, when enclosed in their box, is solid to handle, and free from all rattle or shake to create dust, and the face of each film is in contact with a soft, velvety surface, which preserves it from all harm by abrasion. The carriers are easily and pleasantly handled when changing plates, and if each *exposed* plate (*before being taken out of the dark slide*) has a letter or number gummed on the *back* you cannot get them mixed or exposed twice over, such letters or numbers to correspond with entries in the note-book.

In point of 'compactness,' I find that two dozen plates will stow away into about the *same thickness* as one dozen in ordinary wooden grooved light-tight boxes of a size for corresponding plates. In protection from dust and abrasion of surface the plan is admirable, and the plates will better stand rough usage at the hands of railway porters than under any other system of packing I know of. In lightness, the card frames and box are much lighter than wooden grooved boxes.

When the said two dozen plates are all exposed, unpack two dozen more, and replace the exposed ones in the maker's boxes well wrapped up in best white 'silver paper,' which I have long used and never found chemically injurious to exposed plates, or, if preferred, packed with sheets of the same unsized paper between them. Of course, it would be easy to make a stock of these carriers and boxes to hold *all* the plates taken on a journey, but I think, practically, that two dozen are enough to use unpacked at one time, and it is better, in case of accidents to ruby lamps or otherwise, 'not to have all one's eggs in one basket.' To 'make assurance doubly sure' in the matter of light-tightness of the package, I tie up the card box firmly with flat worsted braid, and slip it into a light tin case with a tight-fitting lid; the package may then be carried about in bright sunshine without danger to the plates.

I strongly recommend this plan to brother workers in the field.

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A VARNISH BOTTLE.

By C. H. Bothamley, F.C.S.

Every experienced photographer knows the troubles which arise from the use of corks in varnish bottles. The cork becomes cemented to the neck, and either breaks in the process of removal or leaves small fragments of cork adhering to the inside of the neck, to say nothing of those which fall into the varnish and make filtration necessary. Bottles with glass caps ground to fit can be purchased, but they are somewhat expensive, and moreover, if a drop of varnish finds its way between the cap and the bottle neck, and is left there, it cements the two firmly together. The following plan will be found cheap and efficient: An ordinary bottle with a fairly long neck is taken, and a thick cylindrical ring of indiarubber is slipped over the neck down to the junction of the neck with the bottle, care being taken that the indiarubber projects beyond the welt of the neck. A short, wide test-tube fits on the ring and forms a cap to the bottle. If broken it can readily be replaced at a trifling cost. The excess of varnish from the negatives should always be poured off into a second bottle, and when the latter is full the varnish is filtered back into the capped bottle.

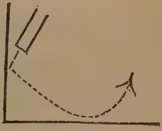
SOME TRIVIALITIES IN PRACTICE.

By J. A. C. Branfill.

Although leather is not often met with in photographic apparatus, I have found it useful in adapting parts not originally intended to fit one another, such as fixing a drop (or other) shutter to a lens for which it was not made, and generally in forming washers or packings wherever they may be required.

I have found it a useful habit when reading a new formula that I may be likely to wish to employ, to note on the margin the number of grains or minims of each ingredient per ounce of solution of normal strength; I can then try the formula with my own stock solutions.

A good rotary motion can be given to the water in which prints are washing, by directing the feed water through an indiarubber tube against the edge of an ordinary deep *papier-maché* tray in an oblique direction, near an angle and pointing towards it, see cut; the tray should be considerably larger than the prints to be washed. I prefer this arrangement to a circular washing pan.



CLOUDS, TONING, &c.

By Thomas Earp.

Having done little in the way of photography during the past season, and less than I might have done had easterly winds been less prevalent, and desirable landscape effects, according to my experience, consequently less difficult of attainment, I can only offer a few hints which may be of value to amateurs like myself.

First, with regard to true cloud effects, when instantaneous work is not in question, I would suggest the plan of devoting a pair of plates to each view, one for the landscape and a second for the clouds. The latter would, of course, receive only the most rapid possible exposure, the sliding front of the camera being a little raised, so as to allow of the double printing being accomplished with more facility. The false lighting of cloud scenery would thus be obviated, and a more harmonious and artistic result attained. I employ a shutter which, though not of commercial applicability, enables me to effect this object, by shading the sky during the greater part of the time of exposure ; but it requires some care and skill in its manipulation, and of course with a cloudless sky is scarcely worth the trouble of using.

Next, with regard to halation, a difficulty which does not much trouble me as I work chiefly with a single lens well stopped down, I would suggest that a well-coated plate of an emulsion giving as opaque a film as possible would in many cases meet every requirement, and probably a piece of ruby paper well saturated with glycerine and squeegeed to the back of the plate would be of further service, and might answer its purpose for several plates.

Next, with regard to toning prints, I have found that by slightly salting the last washing water before toning I economise gold, get a tone which never varies in the fixing, and enables me to use my acetate bath, with occasional strengthening, for a very long period. In fact, the basis of what I am using was mixed at least two years since, and is still in thorough order, as is shown by its retaining a clear purple tinge. I may mention that I always keep it in a bottle full to the cork, and store in a dark cupboard, never even touching hyposulphite till the toning solution is stowed away.

Those who happen to be in haste to prepare a solution (of hypo, for instance) will find it a good plan to suspend the salt, enclosed in a piece of muslin, near the surface of the water in a jug of the required capacity, when rapid solution will result.

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AN INCIDENT IN CONNEXION WITH COLLODION DRY PLATES.

By Marcus H. Rogers (East Brimfield, U.S.A.).

During our sojourn in Florida last winter, we visited by invitation the extensive orange grove and beautiful home of Mr. A. F. Styles on the St. John's River, five miles south of Jacksonville. Twenty years ago Mr. Styles was in the photographic business in Vermont, and being obliged on account of his health to seek a milder climate he went to Florida for the winter, and having an eye to business he took along some collodion plates preserved with tannin—it was before gelatine dry plates had been thought of. He made the exposures, took orders for pictures, and sent the plates home to Vermont—1200 miles distant—for development, and the photographs were sent to his customers from his gallery in Burlington.

For three winters he had a monopoly of the photographic business in Florida ; but becoming enamoured with the 'Land of Flowers,' and foreseeing its ultimate advancement, he sold his property in the North, and bought a tract of land and began the work of planting an orange grove, and he now has 1700 trees in full bearing. His photographic outfit was relegated to a closet for storage, where it remained neglected and almost forgotten for seventeen years, until we visited his place with a camera to get some of the beautiful views to be had there. His house, overlooking the picturesque river, is surrounded with giant oaks covered with Spanish moss hanging in long, lace-like festoons from the lofty branches. The sight of a camera and my enthusiasm as an amateur brought out the above facts of Mr. Styles's early connexion with photography, and he said his old outfit was still in the house. Expressing a desire to see it, he rummaged among the contents of the closet, and brought out the old camera, plate box, and several old lenses, all covered with the dust of years and blackened by time. The plate box was well made of mahogany—he said it cost ninety-five dollars with the camera—and was so constructed that by placing it on the camera and drawing a brass slide a plate was dropped into position, and after exposure, by turning the whole upside down, the plate went back into the box. Giving the box a shake, he said there were some old plates in the box; and he was about to open it when I stopped him, and asked if it would not be possible to repair the camera a little, and try to make a picture on the plates. Last August he had time to attend to it, and has made several photographs, some copies of which I send you herewith. The plates were exposed about the same, as near as he could remember, as when others like them were used seventeen years ago; and having forgotten the formula for their development he had to do it largely by guesswork.

One of the pictures is of a very beautiful flowering shrub covered with white blossoms growing in front of his house; and the picture is as fine as if made on a freshly prepared plate, while considering that it was made on a collodion plate made seventeen years ago, it is a most remarkable photographic curiosity.

I take pleasure in sending the pictures to you.

RESIDUES.

By C. H. Bothamley, F.C.S.

Paper residues, whether silver or platinum, may be burnt readily and without waste in the following simple apparatus: A piece of thin sheet iron or tin plate, twenty-six inches by twenty, is bent into the form of a chimney twenty inches high and six inches square, two inches being allowed for the overlap. About four inches from the bottom two pieces of stout iron wire are fastened across the chimney, and support a piece of iron wire gauze, which forms the grate. A similar piece of gauze is placed on the top of the chimney to prevent any fragments of paper being carried away by the draught. Two of the edges of the chimney are slit for a distance of about four inches from the bottom, in order that the iron or tin plate may be bent outwards to allow the free entrance of air. The stove may be placed on a tray or plate of iron or tin plate, which will catch any ash that may fall through the wire gauze.

IS RETOUCHING LEGITIMATE OR NOT?

By A. G. Field.

Much argument has been raised on the question whether or not the improvement of negatives by the aid of retouching is admissible. It is urged by some that retouching generally flatters, and often destroys the likeness of, the sitter, and is therefore something harmful rather than beneficial. This may be true to some extent, but I have tried to advance in the following paragraphs something in favour of the much maligned retoucher.

In the hands of a *good* retoucher likeness is not destroyed, neither is the sitter flattered, unless a representation of that sitter at his or her best is flattery.

It is well known that the governed lighting of a studio leaves more direct shadows and more 'dirty' half and quarter tints than does the diffused and changing light in which a sitter is *usually* seen. Natural defects, such as warts, pimples, scars, 'blotches,' roughness, &c., are also more prominently reproduced by the close inspection of the lens. Now it is, I suppose, granted that the efforts of photography should be directed not to the production of 'studio presentments,' but to the representation of sitters as they are usually seen. Even in the most rugged portraits by our 'masters in painting,' there is method in their ruggedness. Rough dashes, expressive and effective, are not ugly ; they are merely portions of the representation of a rough and effective face. Perfect representation can only be obtained by the lessening of the distortion, movement, or exaggeration in the lens photograph. How to do this? By the perfectly admissible use of the pencil.

It will be seen that I have used above the word 'distortion.' I will explain this. The chin of the sitter, for instance, lowered till it touches the edge of a high shirt collar, will produce a crease or fold of flesh utterly unlike that sitter's chin and neck. The head, inclined on one side so as to destroy the rigidity and stiffness of its position, will often in like manner cause the flesh on the side of the jaw to bulge in a most unnatural way. Wrinkles on the forehead and between the eyes, if caused by nervous worry and not by age, shaggy (or 'obstinate') and protruding pieces of hair, fixed or 'straight' expression of the corners of the mouth, exaggerated lines of the eyes, nose, or mouth, all these *require* retouching or skilfully cutting away with the sharpened point of a penknife.

If, as some opponents of retouching say, heads should be left as light, the camera, and good development left them, then no spot or blemish of background should be removed, neither should the spots on the plate be cut away or filled in, but should be left 'as the camera left them.'

'Natural effect' has so little to do with photographic results that it is nonsense to speak of being satisfied with the picture 'as nature left it.' In fact, nature does not 'leave it' at all. Our profession is so essentially one of art (with a modicum of nature as a base) that in my mind the use of the pencil and scalpel is perfectly admissible. 'Beauty unadorned' is not beauty in photography, but improvement and beautiful representation is, and always will be, the element of our beautiful art.

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SUGGESTIONS FOR THE FORMATION OF PHOTOGRAPHIC FIELD CLUBS.

By J. C. Stenning.

As one who has derived much enjoyment, not only photographically but socially, from being a member of a Photographic Field Club, it will perhaps be of interest to my fellow workers, both at home and abroad, who may contemplate founding a Field Club, if I endeavour to put together a few suggestions for its formation. Now that photography has become in recent years within the scope of so many more workers—thanks mainly to the gelatine process and to the cheapening of apparatus and chemicals—

there is hardly a locality that is without at least one follower, and a town without half a dozen ; but it is in large towns and cities and their neighbourhood where a Field Club has the best chance of succeeding, as if members are too scattered the difficulties of meeting and intercourse increase. It is possible, where a Natural History Field Club already exists, photographers, if too few to form a club of themselves, might be able to join in the outdoor excursions.

The advantages of a Field Club are manifest, from a photographic point of view, as by intercommunication much is taught and learnt. In my experience—now of thirty years—I have found photographers of all classes, amateur or professional, always ready to impart information and advice, and place their rooms and often themselves at the service of their fellow-workers. I have no doubt this good feeling and generosity prevails amongst the devotees of other pursuits. From the social point of view:—where the members are bent upon enjoying each other's society, and endeavour to make themselves agreeable, a Field Club can hardly be otherwise than a success, and it is to such an association that I owe some of the pleasantest companionships and many most enjoyable outings.

In a club the members, as a rule, have much more chance of obtaining admission to places of interest than an individual has, and here I would step aside to remark that it is of the greatest importance, for their own sakes as well as for other photographers who might come after them, that in private houses and places of interest the greatest care should be taken to avoid doing anything that might offend the prejudices of, or give the slightest cause of offence, to the owners, and strictly to adhere to the terms on which the permission is granted. If these points had been observed in the past, many more houses and grounds, now closed to the public, might still be available. I do not mean that photographers are to blame for this, as I believe, whether professional or amateur, no body of men are more careful of the feelings and wishes of others. A few prints always afford much pleasure to the owner who has given permission ; besides, this method of acknowledgment is thought to be a graceful act. With these preliminary remarks I will point out roughly the lines on which a Field Club might be founded.

It will be a matter for consideration whether it is to be composed of amateurs only, or of professionals, or of both. As to numbers, it will be found that twenty-four members are as many as are convenient, as this number, or even eighteen, at a day's outing may entail difficulties where means of conveyance are limited. Intending members may be introduced at one meeting and balloted for at another, or elected according to the rules of the club. Members should send in prior to election diploma pictures. A subscription should be paid to cover the expenses of postage, correspondence, notices, &c. ; the amount need not be large, say not exceeding 10*s.*—perhaps 5*s.* would be sufficient. There should be a President as well as a Secretary, both to be elected annually or at longer periods. The President will review the work of the year, and before the commencement of the outdoor season give out a subject for illustration by the members. The Secretary will receive subscriptions, issue notices, and generally do the clerical work of the club. As it is upon the Secretary that almost all the work falls, it is essential to the success of the club that he should be well qualified for the post. Honorary members may be elected, who only pay a subscription, and are not otherwise bound by the rules of the club.

Indoor meetings should be held, say from November to March, at one of which (preferably February or March) places should be selected for the outings from April to October, either for one day a-month or oftener if desired, a member being responsible for each day's outing. Notice would be sent out by him to the other members several days previously, giving name of meeting-place, objects of interest, times of trains, stations, and hotel for meeting at end of the day's work, when a meal can be made, also to send in a report of the day's proceedings to the Secretary. The indoor meetings would be devoted to examination of prints, negatives, discussion of processes, transparency exhibitions, &c., and election of members. Each member should be required to send in a certain number of prints, from negatives taken on club days, to form an album of the year's work, and which might be circulated amongst the members. Prizes of nominal value may be awarded, say for the best six or twelve prints, and also for the best illustration of the President's subject; prints to be mounted or not, according to rules of the club. Members who fail to pay subscription, or attend meetings, or to send in prints, would have to be re-elected. Members to have the privilege of introducing a friend at any of the indoor or outdoor meetings. Given a sunny, still day, such as we have so often had during last year, what is more enjoyable than spending it amongst picturesque surroundings, such as abound within a short distance by rail from the chief centres of population, in the company of enthusiastic companions?

If some members desire a longer outing than a day, or a day or two, let them make up a party for a week, ten days, or a fortnight, and visit, with their cameras, say Warwick and neighbourhood, the English or Irish Lakes, Wales, or Scotland, and with fair weather such excursions should prove enjoyable and add to the stock of good negatives. With these remarks I will conclude, and shall be very glad if what I have jotted down should help in the formation of more Photographic Field Clubs, not only in Great Britain, but abroad, especially amongst our American brothers, to whom photography seems as fascinating a pursuit as it is to us in the Old Country.

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A DAY WITH THE CAMERA IN DOVEDALE.

By R. Railston Brown, C.E.

As the Editor has again made his call upon me for an article to our old friend The British Journal Photographic Almanac, I have decided to give an account of the most enjoyable photographic trip I ever had.

The manipulations of dry plate photography are now so much simplified that it becomes a question not so much 'how to take' as 'what to take.' I know of no happier hunting-ground for the photographic brotherhood than Dovedale in Derbyshire. The scenery, while being grand and majestic with its towering rocks and rushing water, is so compact (if I may use the word) that it is just the class of scenery photography renders so well.

The Dale is not more than two and a half to three miles in length, so that one's work all lies close at hand. Every few yards some fresh and charming bit presents itself, and the difficulty is—unless you have plenty of time at your disposal and an unlimited supply of plates—to decide not what to take but what to leave untaken, for if you expose a plate on every pretty bit you come across all your plates will be gone before you get half-way through the Dale.

Some examples of Dovedale scenery were on view at the late Photographic Exhibition, and I think there were very few prettier views in the whole show.

I know of no place where there is such a charming variety of scenery than you get here. The river Dove flows through the Dale, and as it rushes along its course it forms a number of natural cascades, each of these make a charming little 'bit;' then there are the famous Tissington Spires—rocks rising like giants' fingers to a height of nearly 200 feet; then there is the celebrated Reynard's Cave; the Lion's Head Rock and the Caves at the end of the Dale known as Dove Holes; in fact, if any one wishes to get a good set of views he ought to spend at least a week there. I was, unfortunately, limited to one day, but I trust that at some future time to make a longer stay in this lovely spot.

It is not fair to any place to have to rush through it with the camera as I had to do here. One day at least should be spent, note-book in hand, in going over the ground, noting down the time of day when the light will suit each particular view. And here I will say don't go without a pocket compass, it is of the greatest help in determining the best time of day for any view; also take a view meter, this will enable you to find the best standpoint from which to take any view.

And now to describe my trip. I was staying with some friends at Uttoxeter, which is about fifteen miles from the Dale. My friend and I took the train from Uttoxeter to Ashbourne, which is four miles from the Dale. At the station carriages are always in waiting in summer to take visitors on. We chartered a waggonette and drove to the 'Peveril' Hotel, which is close to the entrance of the Dale. We then proceeded on foot into the 'photographers' Arcadia,' and set to work, and a hard day's work we had.

My kit consisted of a 6½ × 4¼ camera, three double slides, a six-inch Ross' portable symmetrical lens, a Kennett's sliding stand—which the water did not tend to improve; the next time I shall give it a dose of grease and blacklead—and a Shew's dry plate changing box. I took two dozen Ilford plates, not forgetting some refreshments. This reminds me of a good joke I heard while at work. There was an excursion to the Dale the day I went; two of the men came up while I was at work. One asked me if I used the dry plate process; I said I did, when his companion made the remark that he preferred the 'meat plate process.'

When first I got into the Dale I regretted I had not a whole-plate camera, but before the day was over I was very thankful I had not, for though there were two of us we were pretty well tired out when we got home.

For a dark room I made use of the wine cellar; I worked with a ruby candle lamp. I used the ordinary washing soda developer.

Ordinary washing soda	2½ ounces.
Bromide of potassium	20 grains.
Water	25 ounces.

I like this developer very much; it gives very clear, soft negatives. As they are slightly yellow in colour you have to be careful not to push development too far or you get them over dense.

I always clear the negatives after fixing in the following:—

Saturated solution of alum	10 ounces.
Sulphate of iron	3 ,,
Citric acid	1 ounce.

When I get a negative over dense I find that a weak solution of chloride of lime reduces it more evenly than anything else. While the negatives are in this solution I *very* gently rub the surface with a tuft of cotton wool.

After this digression as to chemicals let me just add that my day's work turned out a success, and I got some of the prettiest views it was ever my good fortune to take. Trusting that what I have said may lead some brother amateur to follow in my footsteps to this charming corner of dear old England, and wishing our worthy friend the Editor and my readers a happy and prosperous new year, I will close this already too long article.

OXYETHER LIGHT.

By G. R. Baker.

As a result of an occasional use of this light during the past year, I would suggest the following:—

1. Put the sulphuric ether in the cistern or tank some hour or so before it is to be used, and preferably by daylight.
2. Use pumice chambers to jets, or pumice safety tubes immediately behind.
3. Occasionally examine the gauze of jets or safety tube to see that it is not eaten away, and that the powdered pumice is free and is well shaken down, so as to fill up the space.
4. If gas bottles are used, employ a reducing valve, or, better still, the new automatic gas governor, as the force of ordinary valve pressure is troublesome.
5. Keep the indiarubber tubes *solely* for this work, and never by any chance use them for oxygen making or the ordinary oxyhydrogen limelight.
6. Do not move apparatus without turning off the stopcocks of ether cistern or tank.

CELESTIAL PHOTOGRAPHY.

By S. J. Perry, F.R.S.

The great attention that is at present being given to celestial photography, and the progress that has been made during the last few months, render it advisable to record from time to time the forward steps that are being made in this country. Weather may be unfavourable, but watchful diligence will always find its opportunities, so the photographic chart of the northern heavens is making steady progress at the Maghull Observatory of Mr. Roberts, who, single-handed, is achieving what the directors of national observatories are calling together meetings to plan in common. To form a correct idea of the real value of the work being done, it was necessary to compare together photographs of the same portion of the heavens, taken at different observatories with exposures of the same duration, and it is thus made evident that the pictures just obtained with the reflector of the Maghull Observatory contain twice as many stars as the best photographs hitherto published, and bring to light details and extent of nebulous bodies of which astronomical photographers had hitherto scarcely any conception.

The failure of the second crown glass lens for the thirty-six inch telescope of the Lick Observatory is a great blow to celestial photography, but the work being done at Paris, at the Cape of Good Hope, at Harvard College, and at other great observatories, shows clearly what we may expect in the near future from the close alliance of astronomy and photography.

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PRINTING BY DEVELOPMENT.

By S. Herbert Fry.

'First get your negative, then print it,' is an adage which no doubt contains as much common-sense as the more generally acknowledged maxim; but printing by development appeals to that large class of photographers who either can't, or won't, or haven't time to print by any of the usual methods. Those who take photographs for amusement frequently complain of the tedious processes depending upon a prolonged exposure to daylight, and generally entrust this department to men whose business it is, whilst, on the other hand, professional photographers bewail their miserable lot when prints are wanted in the dark winter weather, and long for the day when the revolution brought about by dry plates shall be completed by a shortening of the time required in printing.

But 'printing by development' already promises more than this, for by its means the photographer is independent of daylight altogether, and prefers the use of a gas jet or paraffine lamp, and does not despise even the humble candle, and, moreover, he has no new process to learn, for it is simply development by ferrous oxalate; and although for negatives the oxalate has never obtained a strong hold in this country, still every photographer is acquainted with the routine. I propose, therefore, to give a few hints to those who have not yet tried bromide contact paper, or who having tried it, have met with difficulties.

Firstly, Exposure.—The distance of the negative from the source of light must be regulated by (1), Whether the light is rich in actinic rays; (2), The amount of contrast in the negative. If the negative is flat an increased exposure at a greater distance from the source of light will tend to give contrast, and *vice versâ*. Eighteen inches from a No. 5 Bray's burner is a good average distance to start with, supposing the negative to be of average density, and it is a good plan, having found the best distance and the exposure, to mark it upon the negative for reference.

Secondly, Development.—Perfect cleanliness and freedom from contamination of pyro or hypo is essential. Use the developer not stronger than one part of iron to four or five of oxalate, and well restrained by bromide, say two drops of a sixty-grain solution to each ounce of developer. Do not use the developer more than once. Saturated solutions of oxalate and iron are generally recommended, but the following *one solution* developer will save a lot of trouble:—

Oxalate of potass	6½ ounces.
Sulphate of iron	2½ ,,
Citric acid	100 grains.
Boiling distilled water	20 ounces.

When cool it is ready for use, and keeps well (of course in a stoppered bottle). Wash thoroughly, but do not use any clearing solution between developing and fixing. If the paper is carefully prepared and the development not prolonged it will need very little clearing, which should be done *after the print is thoroughly freed from hypo.*

There is no better way of washing out the hypo than laying the print face down upon a sheet of glass, squirting water upon the back and squeegeeing. Turn the print over and rub the surface with a pad of cotton wool whilst the water is flowing over it, and repeat the process.

THE PHOTOGRAPHIC EXHIBITION OF 1886 FROM A RETOUCHER'S POINT OF VIEW.

By Redmond Barrett.

In visiting a technical exhibition, such as this may be considered, everybody's attention is mostly attracted to those points of interest having closest connexion with their own particular branch. Thus I have been led to ponder over the various exhibits and consider how they influence the position of the retoucher, and I must say the result is not at all gratifying. Although I say this, I must also say that I do not consider that the fault lies at our doors, but must be shared at least equally by the photographers themselves.

A very noticeable feature in this year's collection is, to my mind, the large percentage of *untouched* work, and for this there must be a cause. It is needless to say there are many studies of heads to which retouching would be of no advantage, such as the medal picture of Mr. H. W. Gridley, but there are many also to which skilful and thoughtful retouching would have been a very great advantage. Notwithstanding this, the photographers, in many cases, have decided to do without our help, evidently lacking confidence in our ability to co-operate in carrying out the ideas they had placed before them, if not absolutely thinking that we would ruin their work by touching it. There is little doubt that this opinion must have been formed from experience, but certainly not from the experience gained from the consideration of work done by first-class men. I feel sure I can touch the point where the trouble begins. The fact is, the commercial and the artistic do not always form a happy combination. Like in many other lines, you cannot get excellence without paying for the ability which produces it.

Some years ago, not so very many, either, retouchers commanded good prices for their work, and retouching was looked upon as a desirable branch of the photographic art to take up and follow. As a result of this hundreds went into it; down came the prices owing to the extra competition, and the photographers, grasping at the idea of getting their work done at half the usual price, gave much if not all of their work to the new comers. To this state of things the good retoucher could only protest, but had to reduce his price or throw up the game. He naturally reduced his price, but, in order to make the work pay, could not give the same value as before. Thus the general tone of the work deteriorated, and without looking for the cause the photographers sweepingly offer the really skilful man a back seat. I have a great belief that time, however, will set all this right again. As I mentioned a case where I considered retouching unnecessary, I may as well also cite one where it would have been very advantageous. There was a very fine series of large heads by Fritz Eilender, and I am bold enough to say, although they received a medal, they could, by skilful retouching, have been made vastly better. They were splendid specimens of photographic portraiture, and with careful handling could have been made simply perfect. They wanted quality, not quantity, of workmanship. Other cases similar might be set down, but these will be sufficient for the present purpose.

Should the orthochromatic negatives of H. Dixon & Son come into general use there will be a great saving in the retoucher's department, as many of the defects at present requiring his help will no longer exist. It is the general opinion that there is nothing very startling in this year's Exhibition, but in this sentiment we must also consider that photography is now at such a pitch of excellence that it is very difficult, and, I fear, will remain so, to produce anything that will, as our American cousins say, 'Give us fits.'

WINDOW TRANSPARENCIES.

By C. C. VEVERS.

MANY readers of the ALMANAC will have experienced the trouble and expense of making window transparencies on glass, 'leading' the various pictures together, and finally attaching them, in addition to a sheet of ground-glass necessary to diffuse the light, to the window—no easy matter for an amateur glazier. The new gelatino-bromide papers render the making of window transparencies wonderfully simple, yet quite as effective as those on glass. At a cost of a few shillings, with a few hours work, the professional can make his side lights and dressing-room windows proof against the curious gaze of outsiders, and, while admitting quite as much light as ribbed and ground-glass, his windows will form a beautiful and interesting gallery of art specimens for the entertainment of his unoccupied sitters. The amateur will find scores of uses for his flexible transparencies —such as shutting out dull views, for hall windows, lamps, &c.

Prints are made by artificial light in the printing frame in the usual manner on bromide paper, the most suitable being Eastman's A (thin, smooth surface) paper. They must be *slightly* over exposed and *slightly* over developed, washed and dried as usual. After being rendered translucent by paraffine wax, vaseline, castor oil, or any other preparation which is used for negative films, they are ready for attaching to the glass.

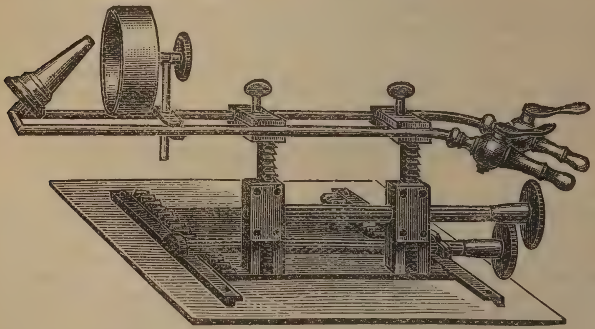
Messrs. McCaw, Stevenson, & Orr, Belfast, manufacture a patent 'Glacier Window Decoration,' an imitation of stained glass, which, being printed on a thin, glazed material (parchment, I believe), can be affixed, and contrasts well, with the delicate black and white photographic transparencies.

IMPROVEMENT IN LIMELIGHT APPARATUS.

By A. Pumphrey.

I have always felt that the ordinary method of centering the light in the oxyhydrogen lantern was defective. The plan has been to have a slide with an upright pin upon it, to which the jet is attached; the slide gave an adjustment of the distance of the light from the condenser, and the height of the light and its position in the centre is obtained by the clip of the jet on the pin. The success of an exhibition, so far as regards the light, depends upon correct centering, which means an even, well-lighted field free from shade or colour. The adjustment on the pin is easily made if the operator has the room to himself and no picture is being shown on the screen. Unfortunately, not only is the jet easily set, but it is quite as easily unset, and many an exhibition have I seen marred with a shade of colour creeping in at one side of the field from the light getting out of centre.

I enclose a sketch of an arrangement which is more satisfactory to me than any other I have tried. It consists in placing the jet on a stage much the same as the mechanical stage of the microscope: one set of racks raising the jet, and another moving it to right or left, and being placed on a slide any adjustment can be made even when the lantern is closed; the jet is held at two points so that it cannot turn.



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THE AREA SYSTEM OF MARKING LENSES AND DIAPHRAGMS FOR PHOTOGRAPHIC PURPOSES TO ENSURE CORRECT EXPOSURE.

By George Smith.

Every one knows that there is a distinct relation between the aperture and focus of the lens which must be accurately known in order to ensure correct exposure. If he only uses one lens and one aperture, he will soon find that, even with the same light, the necessary exposure for various subjects will vary enormously. If he was compelled to work with such a lens, the best aperture he could choose would be what is known as $\frac{f}{16}$; that is, that the diameter of the aperture of the hole in the lens mount should be one-sixteenth of the distance from the lens to the focussing screen. This ratio of aperture to focus—one to sixteen—is the one which, by general consent, has been allowed as the one which, on the whole, presents the fewest disadvantages. It would be an excellent system to begin with if even he found—as he undoubtedly would find—that he wanted more than one or two lenses. If they were all fitted with the same relative apertures, $\frac{f}{16}$, he would soon find that when he had mastered the correct exposure it would generally lead to improvement in the results if he had the means of altering the size of the aperture, and therefore the duration of exposure.

This is all that the 'Area System' professes to do. The learner must learn the conditions which govern exposure generally, and then the area system will greatly facilitate the application of that knowledge to the real work which requires the continual change of both lens and aperture. He must then, first of all, make a table for himself of the normal exposures necessary for different classes of subjects, variations of light, and speed of plates, from which the still necessary correction for the relation of lens and stop will be shown at a glance by the area numbers.

The principles upon which the area numbers are calculated are extremely simple. They are applicable to any existing lenses in daily use without any infringement of patent rights, and will be found exceedingly useful in everyday work, while also affording a very simple and accurate method of comparing results with other experimenters.

Any aperture or stop is measured for its actual diameter in sixty-fourths of an inch. The simplest way of doing this is to take any of the mechanical drills to be got at any tool shop; the number of the drill is its diameter in sixty-fourths of an inch. This number is squared—multiplied by itself; the product is the exact area of the aperture in circles each one sixty-fourth of an inch in diameter. For instance, supposing a hole were made with a No. 20 drill, or being already made the No. 20 drill fitted it, 20 × 20 = 400 would be the actual area of the aperture in circles of each one sixty-fourth of an inch in diameter. For convenience the last figure is omitted and the stop marked 40. This, then, will always be No. 40 stop, no matter for what lens it may be used. All the other stop numbers are found in the same way, by finding the diameter in sixty-fourths of an inch, squaring, and striking off the last figure; the remaining figures are its area number.

Any lens is measured for its actual focus by measuring the distance of its burning point from the back of the lens in complete quarter inches, neglecting fractions. Suppose, then, a lens was found to measure 20 quarter inches—20 × 20 = 400, striking off the last figure, 40 would be its area number. Any other lens would be measured the same way in quarter inches, this number multiplied by itself, and the last figure struck off, the remaining figures are its area number. Thus it will be seen that every stop has its own number, and that whatever relation that number bears to that of the lens it is used with gives at a glance the relative exposure required. If it is the same as the lens number, the exposure is exactly the normal table exposure for $\frac{f}{16}$; divided into the lens number the product is the exact multiple or fraction of that exposure necessary. Thus a doublet lens should have each lens marked with its area number separately. The area number for the combination will be the two separate numbers added together and divided by eight. Thus by numbering the stops of, say, a rapid rectilinear lens, separately after careful measurement, and then calculating the area numbers of each lens, as well as that for the combination, not only would the exact exposure for either of the lens separately be ascertained, but very probably great discrepancy in the real relations of the stops.

In practice no table at all is necessary after a moderate experience. No table can estimate the value of varying light, and no photometer is more than an approximate guide. Every factor, light, time of day, season, should be separately estimated and noted as a reason for variation from the following simple formula — Mr. Howard Farmer's table of distances of the nearest important *deep* shadows :—

10 ft., 4 ; 20 ft., 2 ; 40 ft., 1 ; 100 ft., $\frac{1}{2}$; 100 yds., $\frac{1}{4}$; quarter mile, $\frac{1}{8}$; over, $\frac{1}{10}$ seconds.

This can be easily remembered or jotted down as the only table, and is an excellent standard for ordinary rapid plates, thirty times — aperture $\frac{f}{16}$, bright summer diffused light, best time of day and year here or anywhere. Sunshine reduces exposure one-half, but not unless the shadows are lighted up by it, either directly or by reflection.

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STEREOSCOPIC WORK.

By Francis Cobb.

Amid the many advances in the different sections of photography, it is much to be regretted that stereoscopic work appears to be not only losing ground but going out of sight altogether. Among the great army of modern amateur photographers how few are the possessors of a pair of stereoscopic lenses, and so few and far between are such instruments that quite recently I challenged a stranger as being an old hand at the black art, and when asked how, in face of the brand-new outfit, I had arrived at such a conclusion, I pointed to a pair of stereoscopic lenses as my justification, and, as it proved, rightly so. Yet some of the most beautiful effects that an amateur can produce to delight his friends are by the aid of the stereoscope. Those who can remember the magnificent specimens that Breeze used to exhibit at the Crystal Palace twenty years ago of breaking waves and moonlight studies, may also remember the expressions of wonder and delight that they gave rise to; and what more useful ornament can a drawing-room table possess to amuse a visitor than a well-supported stereoscope with a good supply of slides?

That the art is not a lost one is shown by our contemporary, John Nesbit, whose landscape slides are deserving of as much admiration and commendation as those of an earlier photographic period. It would almost appear as if the prevailing fashion of lantern slides had been detrimental to those of the stereoscope, but there is no reason why this should be so. The two things run side by side harmoniously, and while the one requires costly apparatus and a large room the other is with us in our houses and sitting-rooms, a kind friend ready to wile away an otherwise dull half hour at any time.

The thing was once popular, and I trust amateurs especially may be induced to give it the attention it so well deserves, and assist to restore that popularity to the stereoscopic picture which ought never to have departed from it.

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ENLARGEMENTS ON BROMIDE PAPER.

By J. Vincent Elsden, B.Sc. (Lond.), F.C.S.

One of the greatest difficulties experienced by amateurs in their first attempts to produce enlargements upon bromide paper is the difficulty in procuring pure whites. However clean the dishes may have been, and however thoroughly the washing may have been effected, it not unfrequently happens that the enlargement, on drying, shows a considerable amount of discoloration, completely spoiling its effect. The permanence of this discoloration is often such as to withstand all attempts to remove it. Clearing solutions may appear to have some temporary effect while the paper is wet, but on drying the yellowness reappears in all its vigour. It is astonishing also what a depreciatory effect even a very slight discoloration of the whites has upon the general appearance of the enlargement, and how flat and displeasing the most vigorous picture becomes under its influence.

Now I have never been troubled with any sign of yellowness after once adopting the following method, whereby the iron of the developer is prevented from becoming deposited in the fibres of the paper. The method is not new, but at the same time it is not so universally known as it should be. After development, before any attempt is made to wash off any of the developer with water, the print is well washed with a solution of citric or acetic acid and alum. Of course the developer is previously drained from the print. By thus thoroughly acidifying the paper before it comes into contact with any washing water perfect purity is maintained in the whites after washing and drying. I have followed carefully the instructions supplied with several different samples of paper, but the above is the only method which in my hands has given perfectly satisfactory results.

It is necessary to wash very thoroughly before fixing to avoid loss of half tones by solution of the silver image.

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EMPTIED PLATE BOXES.

By C. Oakeshott.

These will accumulate in every studio; one hesitates to destroy them, thinking that sooner or later they may be of service. Most of these boxes being well and substantially made, may with very little trouble be converted into handy and useful receptacles of plates for use in the dark room.

Take two boxes same size, separate the in from the outsides; then bring the two insides together, edge to edge, and paste a band of stout brown paper round three of the sides; do the same with the outer lids, and set aside to dry. Then with a penknife cut out the unpasted sides, and you will have a light and a light-tight box, requiring only the grooves to be glued in to separate the plates. If the grooves be made wide enough to pass two glasses back to back, the box will comfortably hold a dozen plates.

It will be an improvement to cut off about half an inch from the open end of the outer box, and glue it on the closed end of the inner; this will give a grip to open with, and be an additional security against the entrance of a strong light.

THE GATHERING OF 1887.

By Mark Oute.

I was at the first Convention; if you were there, I guess
You could not fail to be impressed by the general success.
Though Andrew Pringle failed at first, it was the seed he'd sown
That, taking root in fertile soil, had to full fruition grown.

The Derby Show was rather small, but, then, it was the start—
The full meaning of the meeting was but understood in part.
The days were few, the time was short; some, wondering if they'd go,
Woke up to the conviction that the thing was past, you know.

Most things have small beginnings, and this amongst the rest;
Give it a little breathing time 'twill flourish with the best.
We now a little leisure have, to work and none need fear
But the gathering of the summer will be worthy of the year.

A happy thought, this meeting—for the lovers of the art
Will together at this concourse the year's advance impart,
And all the small experiences will in one lot be bound;
In the council of the many, surely wisdom must be found.

Failures and their causes talked, with varied dodge and hint,
That will lead to future profit, though never seen in print;
For many men too bashful are to let their light so shine,
All unconscious of the value of the metal in their mine.

And the meeting and the fellowship of those good workers true,
Whose course we trace from week to week and have often wished we knew,
Is worthy of this yearly meet, its trouble and its cost.
Count the pleasure and the profit—say—is it labour lost?

And the pleasure of that outing we all need now and then,
A holiday's enjoyment by mount, and dale, and glen!
If you wish to do the lazy, leave your camera at home,
And free from every business care to our pleasure party come.

Just send on word to Briginshaw, tell him to note you down,
A scrip he will return per post, good value for a crown:
The seal of membership it bears, with full credentials given,
Then at Glasgow join the gathering in eighteen-eighty-seven.

ON KNOWING SOME OF THE PROPERTIES OF A DRY PLATE AT SIGHT.

By A. Pumphrey.

The difference between the mechanical operator and the photographer whose work is, to him, both an art and science, appears to me to lie very much into how much insight he has into the varied properties of the materials he uses. In meeting with fellow workers and asking what plates they use, I have generally had for answer the name of some maker, but if I asked what kind of plate it was, how was it prepared, they seemed to think that it was none of their business; to such photography may be an art, but hardly a science.

I have myself laid down some general distinctions, which, although they may not be new, may be of service to that large class of photographers who never make their own plates.

There are two broad distinctions in the plates made and in the market now—those which are made sensitive by boiling or stewing, and those which are made sensitive by the use of ammonia in some way or other. These two, I consider, can be told at sight; those prepared with ammonia are a darker yellow, having even a tint of green in the yellow, and those prepared by boiling are a lighter or lemon-yellow; of course, the quicker the plate is the darker is the colour.

The two makes can be easily distinguished if examined by daylight, but not if only examined by the light of the dark room. As good a negative can be made on one plate as the other, providing the exposure be adequate to the speed of the plate.

As quick a plate can be made by one process as the other, at least that is my experience, and I know of different makes of plate, which I suppose the one to be prepared by stewing and the other with ammonia, and the speed of one is equal to the other.

But there are other properties besides speed, and I have always decided that the advantage is decidedly in favour of the stewed emulsion. It will stand more forcing in case the exposure is not long enough, and, what is perhaps of still more importance, the plates keep much better.

A highly sensitive plate is, I think, at its best as soon as made, but the ammonia plate deteriorates more quickly than the stewed. I have noted in all kinds of plates prepared with ammonia (as I think) indications of change when kept a few months.

A plate containing iodide as well as bromide may be known by the development of the image starting slower than one containing all bromide.

If a plate is coated with substratum, it can (often) be told by tearing the film when just developed before the films of different solubility have become fully wet, and carefully examining the torn edges.

Trusting these few remarks may serve as stepping-stones to attentive observation; they are points which have come under my observation in the past twelve months.

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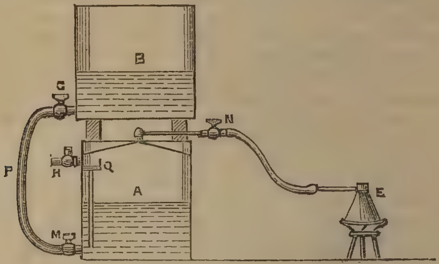
A PORTABLE HIGH-PRESSURE GASOMETER.

By Albert W. Scott.

It was once my duty, during the summer time, to superintend the apparatus required for a nightly exhibition of the limelight, lasting for several weeks. At first I used gas bags, but although these were of the best quality, I found that the oxygen bag lasted a very short time indeed; in fact, the expense of maintaining the gas bags alone was not much short of twenty shillings weekly. This was clearly an extravagant amount, and it became necessary to find a substitute for the oxygen gas bag. The coal-gas bag, not deteriorating so rapidly, was considered a satisfactory receptacle for that gas. The remarkable rapidity with which the oxygen bags corroded was due to the sultry weather prevailing at the time, as a similar bag had lasted fairly well during the winter. Accordingly a gasometer was made of the ordinary pattern, having a displacement chamber to lessen the quantity of water required. The gas chamber, which moved between upright guide rods, was three feet in diameter and the same in height, and should have held twenty cubic feet of gas. This it did so long as no weights were used, but it being necessary to put three or four hundredweight on the top to get sufficient pressure, it was found that the capacity was reduced by one-third, this space being occupied by the displacement chamber. The gasometer was sent back to the maker, who altered it according to instructions, after which it worked quite satisfactorily.

The woodcut illustrates the new arrangement in section. A is the cylindrical gas chamber, three feet in diameter and height; it is closed in on every side so as to be both gas tight and water tight. Upon the top of this vessel are placed two hollow wood boxes, about two feet long by six inches in height and width. These boxes support the cylindrical water cistern B, which is open at the top. When the apparatus is packed for travelling the gas chamber, A, is put inside the vessel B, which is made of a larger diameter than A. There are three taps of large bore, G, H, and M, which are unscrewed when travelling, also a gas-pipe and stopcock at N. There is also a piece of rubber hose, P, of one and a quarter inch bore, by which the taps may be connected. Now, we will suppose that B is filled with water up to six inches from the top. The taps, G and M, are connected by the pipe P, and turned on; the water will then flow from B into A, driving out the enclosed air through the stopcock N, which is turned on. When the vessel A is completely full of water, the tap N is turned off. The next thing to do is to fill A with oxygen gas. This is done in the ordinary manner from a retort, E, heated by a gas stove. No purifier or 'cooler' is used, and the chlorate of potash should be in



crystals, not powdered. When the oxygen is generating freely the retort pipe is connected with N; the pressure of the oxygen gas upon the surface of the water in A will gradually drive the water through the pipe P back into the cistern B. When A is quite full of gas, the surplus oxygen will also bubble through the pipe P into the cistern B, and escape; when this takes place all taps are turned off and the retort disconnected. Now we find our gasometer fully charged with gas and ready for connecting with the limelight. The pipe P is pulled off the tap M, and connected to H. The water descending from the cistern B then flows into a small box, Q, which is open at the top, and has an overflow pipe to convey the water without splashing to the bottom of the gas chamber. This box is permanently attached to the interior of the vessel A, and the reason why it is used is that the pressure on the gas is far more uniform than it would be if the water were allowed to flow through the tap M. The pressure of gas is regulated by the distance between the tap H and the surface of the water in the cistern B, that is, about two feet of water pressure; this is amply sufficient for any limelight. When the gasometer is supplying the jets with gas from the pipe N, the tap M is turned off, and the three taps, G, H, N, are turned on.

The cut illustrates the arrangement of the taps when the gasometer is being recharged from the retort. The apparatus is very simple and effectual in its practical working, although it may appear complicated at first sight. The material used in its construction was galvanised iron, with joints both soldered and rivetted. The gas capacity was twenty cubic feet, and the weight about seventy pounds, exclusive of the water. The cost was about the same as that of a first-class gas bag of ten cubic feet capacity.

CARBON SOLAR PRINTS.

By William H. Sherman (Milwaukie, Wis., U.S.A.).

That artists, whose vocation is to finish photographic enlargements in crayon, India ink, or water colours, should be supplied with foundations for their work which are not only conjecturally permanent but positively and undeniably so, is a truism which will be conceded without argument. It can no longer be held that photographs of the common kind answer to this indispensable condition. They have been tried in the balance and found wanting. The belief that the complete eradication of the fixing agent from the silver print would save it from deterioration, has proved to be a delusion. And now that pictures finished on such prints in the ways above mentioned a score of years ago show decided symptoms of decline, it is high time to discontinue their use on pictures professing to be permanent.

An audience of English photographers need not be informed that prints in carbon are permanent. Presuming that in the home of the autotype, and where the oldest wood engraving in the world—the St. Christopher of 1423—is owned, illustrating, in the perfect preservation of its lines, the permanence of carbon pigments, a brief description of a rather novel process of producing carbon solar prints in use here in Milwaukie may be interesting to some. I offer it as a small contribution to the pages of The British Journal Photographic Almanac. It is as follows:—

Gelatine, refined lampblack, bichromate of potassium, and water, are mixed in suitable proportions. The vessel containing these ingredients is placed in a water bath, which is heated until complete admixture and the requisite degree of fluidity are reached. It is then applied to the drawing-paper upon which the picture is to be finished, in the form of fine spray by means of an air-blast from a cylinder charged with compressed air. On this mode of applying the pigment the success of the whole operation depends. The coating thus applied is granular in form, which permits the light to penetrate it to such an extent that the middle tints are saved from being washed away in the development, thereby evading the necessity of a double transfer. The pigment dries quickly, when it is ready to be exposed to the image of the solar camera, and the requisite exposure is only about one-tenth to one-fifth of the length of that required for silvered paper. The picture is developed by washing off the unimpressed or soluble pigment with hot water. For this purpose the print is wetted and placed in an upright position on a stretcher covered with muslin; the water under considerable pressure is showered upon it through a rose connected by a short hose to a double faucet supplying it both with hot and cold. The temperature and pressure are easily regulated by increasing or lessening the flow of either or both at will. Finally, the print is washed to remove the little remaining chromium salt from the paper, which being done, it is ready for mounting. The surface of the print is entirely without gloss, and the 'tooth' of the paper is improved by the stippled effect consequent upon the method of applying the pigment. The tone of the prints, being absolutely unvarying, is, also, in exact keeping with the crayon or ink afterwards used in finishing—either of which takes to the paper as kindly as if no print were made upon it. When required for water-colour work a neutral grey is used instead of lampblack alone. Many artists of experience, whose practice had long been confined to enlargements produced by other method, are now using these exclusively.

HINTS ON TAKING PANORAMAS.

By F. York.

In doing this class of work it is customary to level the camera stand and work the camera round. This plan does very well from positions of low elevation, but when the view has to be taken from a great height then it is necessary to lower the sliding front to the utmost to obtain foreground. In doing this you are using the edge of the lens with defective definition unless a small stop, $\frac{f}{32}$, is used, and even then the corners are defective. I recommend a slow drop shutter, as it is most important to secure uniform exposures.

The plan I have found successful is first to level the camera stand and decide how many pictures you intend taking, noting where each joins, then depress the camera to get over the defective corners, and when you have decided on the amount of foreground swing the back to get it perpendicular, refocus, and *be sure never to alter it*, or a perfectly identical horizon cannot be obtained. The camera stand will have to be adjusted each time by moving the front leg to secure the perpendicular of the focus glass: this arrangement will secure the same amount of foreground in each picture and an identical horizon.

Having pointed out the necessity of accurate exposures, I will now state the importance of identical development to secure uniformity in the several pictures. I recommend taking a duplicate of the first exposure, and carefully note the quantity of developer and time of development, and do the remainder precisely alike. Should small plates be used several may be developed in one dish. Following these instructions the results will be uniform in character, tone, and density.

The sliding fronts of cameras are not often made so that they can be reversed. This is very important where much foreground is required, as the flange is generally placed about half an inch above the centre.

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HALF TONES.

By J. Hubert.

In writing an article for the Almanac I am rather uncertain what tone to adopt, in consideration of the mass of valuable information to be found within its pages. I feel myself unable to write in the highest tone, and I have an abhorrence for the lowest, so if I am to be in tone at all, what course is left to me, but to stop midway and write on half tones. As, undoubtedly, this is not antagonistic to the interests of photography, and I think it to be of primary importance, I will pitch my key that way, and begin with A sharp.

When thus pouring forth the praises of half tones, likened to sweet music, whose very sweetness is derived from them, I feel convinced that, without half tone, the photographer, like the itinerant musician, could only produce work, alike wanting in life and soul, and thus half tone, giving life to the picture, points to a soul in the producer, so supplying what may be called the secret of successful photography. If it be not so, how is it that the photographer, thirsting for knowledge, vainly parades the streets of London in search of the beautiful amongst photographic productions? Can it be that commercial interests have something to do with the matter? Is it their want of knowledge of what is necessary, or are they prevented, from reasons of economy, to supply that quality of graduation in half tones, without which the most refined artistic taste and the most perfect manipulative skill will be checked? However that may be, the fact remains that a photographer cannot make sure, even if he has found a clean, rapid, and cheap plate, that it is possessed of that range of half tones, which will be the necessary adjunct to stamp the seal of art upon his work. What is the meaning of half tone, and how it can be obtained, will be the subject of my remarks.

Every picture, be it photograph or painting, is composed of lights and shades, and whenever we admire any particular production for its relief and lifelike qualities, we may speak of it as possessed of a fine range of half tones. The transition from the highest light into the deepest shade is effected in such a manner, that each particle of delicate detail is surrounded by one superior and one inferior light, which, beginning with the highest light, either derives its value from the source of illumination or by gradual reflection. If we were to cut out the highest light and deepest shade of a picture, placing them side by side, we should expect to see the greatest contrast of white and black. This contrast, abruptly appearing in a picture, would cause it to be devoid of all life. The interposition of a greater or lesser range of semitones increases or decreases the value of the work accordingly.

As the true character of the human face depends upon the correct rendering of half tone, it follows that it is of the greatest importance to obtain the widest range, but, as in the case of a whole-length or three-quarter picture, it would not be pleasing to see the range of half tone sacrificed in the drapery, because this occupies a subordinate position to the face, we must find means to balance the whole by judicious lighting. Here the science of photography is opposed to the art of photography, and, to make matters worse, it is difficult to find cheap and rapid plates with a wide range of half tones. However, the existence of a few reliable makers who supply these qualities, and the fact that it is impracticable to use the more expensive makes, shows that a little trouble in the selection of a plate and an occasional trial with the sensitometer will conduce to overcome the difficulty in that direction.

All photographers are aware that, ordinarily, the human face of the white man is over exposed when the appending form, possibly clad in black, has only just received sufficient exposure. Now if we want a plate which will give the widest range of half tone and utmost speed, we have only to take several kinds and test them with the sensitometer. In the absence of this rather expensive and, in its present form, more or less unreliable instrument, a substitute may be adopted by superimposing a number of thin papers, preferably of the German kind, called *felinpapier*, of the size of a magic-lantern slide, to form steps, which must be crossed with similar ones so as to form little squares, fifteen to twenty in number, of which the first constitutes one thickness, the second two, and so forth. Now take as many plates as you have selected for trial, and, placing them upon this sensitometer or substitute into a printing frame, expose each exactly for the same period by a weak artificial light. Develope and remove from the developer together, then fix and examine, having previously taken the precaution to mark the maker's name, &c., upon each plate. If the first few squares—say, No. 1 to 4—in some or one of the plates appears of the same density, or nearly so, you may be sure of want of half tone. Select that kind in which the first number appears opaque, the second less so, and the third still less, and so forth, until complete transparency excludes any more squares from view. It is a matter of course that the kind of plate representing the highest number of squares is the most rapid. Before making this trial, however, be sure to find out the exposure necessary which will show no trace of fog, or else you will get into a fog yourself.

Now, with the aid of such a plate, proceed to work, and, posing your sitter, draw the light, or medium blinds, or curtains of your side light, leaving only a small aperture immediately behind the sitter, and between him and the opaque portion of your side light, which touches the background, open the blinds of your side top light, taking care to draw them overhead the sitter. With the aid of this light and repeated trial, in which, if necessary, a white reflector, judiciously arranged, will give material help, you will observe a fine high light, with all the delicate gradations distinctly visible, but slightly more intense than you would wish to see them in the photograph. Now expose for the drapery and shadows, and I doubt not that you will obtain a fine range of half tones.

When you have mastered this, and are possessed of artistic tastes, all that is wanted to make success certain is keen observation, studious avoidance of that which is unnatural, and perseverance, which last-named quality is the keynote of all.

In conclusion, I trust that the reader of this little essay *on half tone* will not consider it *half done*, in which case I shall think myself amply rewarded.

THE LAST PRINT IN SILVER.

By Edgar Clifton.

'Tis the last print in Silver,
Left mould'ring alone,
All her gold-toned companions
Are faded and gone.
No print of her kindred,
Albumen, is nigh,
To reflect back her jaundice
So sad to the eye.

I will leave thee, thou lone one,
To vanish away,
And to all fellow-workers
With confidence say,
Go, print now in Carbon,
Or Platinum choose
As long recommended
By friend Jabez Hughes.

So soon may all follow
A 'Permanent way,'
And from out of our albums
No prints fade away.
For when Albumen's yellow,
And Chloride is flown,
Platino and Carbon
Shall still hold their own.

A TESTIMONY IN FAVOUR OF SODA FOR DEVELOPMENT.

By William Hanson.

Having used soda in conjunction with pyro for development several years, I am able to testify that it is better, all things considered, than ammonia. During the time it has been in use in my dark room it has been tested with all sorts of subjects and sundry brands of plates, yet without fault. Should any advocate for ammonia be tempted to give soda a fair trial let him beware of the *bi*carbonate, because *carbonic acid* is a powerful *restrainer*, and for this reason nothing should be added to the developer that would liberate it in quantity.

HOW TO ENSURE CLEAN, BRIGHT NEGATIVES.

By S. R. Bottone.

Nearly all workers with gelatine plates, especially if they use a pyro developer, are troubled with yellow staining or yellow veiling. Indeed, this is so usual that I have heard many try to gloze over this defect by saying, ‘It makes no difference to the finished picture.’ My experience is that it makes a vast difference both in time required to print and in the ‘pluck’ of the print itself.

Those who care to avoid this defect can easily do so by adopting the following mode of procedure:—

Prepare a saturated solution of potassium oxalate (neutral). To each fluid ounce add eight grains of potassium bromide. Call this the *restrainer*. Make up a ferrous oxalate developer by pouring one part (by measure) of saturated solution of ferrous sulphate into three parts of saturated solution of neutral potassium oxalate, with constant stirring. Add to this one half part of the restrainer if the picture has had a normal exposure. If you have reason to fear the exposure has been very much too long, you may add one or even two parts of the restrainer. This treatment will enable the operator to leave his negatives in the developer until the desired density be obtained without injuring the shadows by standing.

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THE ALKALINE DEVELOPER.

By William Brooks.

During the past year I have made numerous experiments with the alkaline pyro developer: almost every one has their pet formulæ. In my own practice I cannot find any alkali to equal liq. ammonia on the score of cleanliness and fineness of detail, with all its volatile properties that we have heard so much about. I have tried potash but do not like it; I think why it finds favour with many is because the image can be brought out more quickly—there are a great many who pride themselves as to how many negatives they can develope in an hour. I readily grant that ammonia is slower in its action when compared with potash, but in my hands the quality of the image is nothing to equal one developed with ammonia.

When developing I never take into consideration time, my only aim is to get the best possible result. I have never yet seen a negative that has been rapidly developed, but what has been more or less faulty as regards gradation; it is by this system of rapid development why we see so many of the flat, lifeless pictures as we do. The principal of my negatives are taken to make lantern slides from, and to gain the best result I require a negative full of gradation: there is one thing certain, that if the negative does not possess gradation it cannot be brought out, either in print or lantern slide. I have tried the soda developer as put forward in its various forms, and also potash and soda mixed, and at last came back to the ammonia. Some years since I published the system under which I worked, and this year the only change that I have made to it has been to use in conjunction with the pyro, bisulphite of potash instead of sulphite of soda; at one time I used the latter in cool weather, in warm summer weather I was obliged to give it up, as at times it made matters worse, by way of giving a yellow image, which it was intended to correct. The knowledge of bisulphite of potash I gained from the little memorandum book sent out monthly to photographers by Messrs. Mawson & Swan. In using the sulphite of soda we were told to use it in quantity of four times by weight to that of the pyro, but with the bisulphite of potash, we use weight for weight with the pyro, I find that it works well with almost any formula. In my hands, if sulphite of soda be used and the plate is under exposed a yellow image is the result. I do not find it the case when the potash bisulphite is used; instead of the yellow image we get one of a neutral tint, or of a blackish tone, which I consider far preferable to a bilious-looking negative. I have now had nearly twelve months' experience with it and am delighted with it. I think in the soda sulphite it is the soda base that gives the yellow colour. If by chance I omit the bisulphite and get a yellow image, I much prefer the use of sulphuric acid, using about five to ten drops to the ounce of water; in my hands it seems to answer better than citric acid, and far less expensive.

I always think the gradation in a negative is better when it is of a neutral tint than of a yellow, and one can better judge of the printing qualities of a negative.

I trust these few lines may be of service to those who like to see perfection in the negative as well as in the print.

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SUGGESTIONS ON LIGHTING.

By T. Protheroe.

In these days of extra rapid plates and quick acting lenses we are apt to take pictures with a deal too much light, and, on the other hand, we are often surprised to find excellent results on a dull day. Having a little time on hand last spring for experimenting, I tried the effect produced by different mediums on my studio light, the results of which I shall be very pleased to submit to your readers, to some of which the idea may be of use.

I don't suppose for one moment that the report of the results will be new to all your readers, and many will be found skipping this contribution and whistling inwardly 'Old lang syne;' but I have seen from time to time questions from your correspondents inquiring into 'the best means or medium for softening the light in the studio,' and various methods recommended, each, of course, being the very best. Some advocate tinted glass of various hues, others ground-glass, white calico, muslin, dabbing putty, solution of Epsom salts; all very good in their way, no doubt.

We must start with the premises that we want to get soft, delicate pictures, full of half tone and gentle gradations, from the highest point of light (without the aid of the retoucher) to deep black in the intense shadows. The question arises, How is this to be done? To those who can manage this difficult problem with a clear glass skylight in a direct light this article is quite superfluous, but to those who find it difficult I would advise them to try sheets of thin, waxed paper, to be obtained at wholesale stationers; I believe it is chiefly used to manufacture firestove ornaments, &c. The price I pay is 8*d.* per quire. I find this paper will keep white for a long time, and obstructs the light less than *papier minéral*, which turns yellow after two months. I use starch paste to stick the paper on, putting it on the edges of the paper only. When your glass roof is lined entirely with this paper, you will be astonished at the beautiful, soft, diffused light; then with the aid of spring blinds, mounted to work horizontally and perpendicularly, the light can be adapted to any requirements. I find by placing the sitter some distance from the background, say seven to ten feet, I get an atmosphere behind the figure that is impossible to obtain by placing him (or her) close to the background. I believe in having a large light to work with, but thoroughly under control. My largest studio has above two hundred square feet of glass in the roof, which is of great use occasionally for taking large groups, &c., on dull days and in winter, when we are glad to get every square inch of light; but in fine summer weather I often take pictures by only using six or seven feet square, and obtain the best artistic results. If any member of our fraternity should, through force of circumstances, be obliged to use an east light, or north-west ditto, I can assure him, from personal experience, if he tries the thin, waxed paper, he will have a light as serviceable as any he could wish, and with the aid of that essential ingredient brains, ought to be able to produce work of the highest class.

Dear Mr. Editor, I have 'ground my axe' and must now take this opportunity of wishing you health and prosperity on your welcome return to the old post of THE BRITISH JOURNAL OF PHOTOGRAPHY. 'May your broad shadow never grow less.'

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SCIENTIFIC DEVELOPMENT.

By WILLIAM BISHOP.

ON page 199 of the ALMANAC for 1886, there appeared an article with the above title, by Harry Platt, of Nantucket, U.S.A., describing a mode of development by carbonate of soda, carbonate of potash, and sulphite of soda, with pyrogallic acid, which was stated to have given good results; and the writer asked at the close of the article for information as to its working with other than American plates, to which his experience had principally been confined.

During the year I have given the mode of development suggested by him a tolerably extensive experimental trial with various English plates, and have found it entirely satisfactory, especially with certain brands, both for rapid and slow work. The greater part of what I have done has been with quite an ordinary lens, and a shutter giving a working exposure of $\frac{1}{80}$ (one eightieth) part of a second. With this the developer gives a control and a depth of detail which I have been unable to obtain by any other developer which I have tried, while the latitude obtainable by varying the proportions covers the entire range between rapidity and normal exposures.

I have found that the developer is capable of modification to suit the varying conditions of the chemicals, and now use the ordinary commercial articles instead of the specially dried carbonates recommended by Mr. Platt, with no injury to the result.

I found, too, in practice that the quantities given by him were inconvenient, and here another modification has been found useful. The developer as I now use it is made as follows:—

No. 1.—Soda Solution.

Carbonate of soda (ordinary, not bicarbonate)	16 drachms.
Sulphite of soda (crystals)	8 ,,
Water	8 ounces.

No. 2.—Potash Solution.

Carbonate of potash (ordinary)	16 drachms.
Sulphite of soda (crystals)	8 ,,
Water	8 ounces.

This giving the convenient formula of one drachm sulphite soda and two drachms carbonate soda or potash to each ounce of water, a great advantage in increasing or reducing the quantity made.

With regard to the point raised by Mr. Platt as to the difficulty of keeping pyro in solution so as to preserve its active qualities, I have found no difficulty in this respect by adopting the following formula, which is well known to many workers:—

Pyro	80 grains.
Bromide potassium	40 ,,
Sulphite soda	20 ,,
Nitric acid	10 minims.
Water	5 ounces.

This concentrated solution has kept in perfect order for three months or more, and only requires to be diluted with three times its bulk of water when wanted for use to give a standard solution of four grains pyro to the ounce.

The mode of working is generally similar to that recommended, except that I always mix the solutions before applying to the plate. Thus I take for ordinary exposures two parts diluted pyro and one part combined soda and potash solutions (combined in equal volume), and apply direct to the plate. For very rapid exposures the pyro solution and the combined solution are used in equal parts. The image soon appears, and its progress may be easily regulated, the addition of soda giving contrast and of potash giving detail. Sometimes a finish of more pyro is useful, but that entirely depends on circumstances.

The combined carbonate and potash solutions will keep indefinitely, but it is desirable also to keep separate solutions for the sake of manipulating as described.

In the modifications which I have mentioned there may be some little departure from the strict principles of chemical equivalents, but I think such departure is in the direction of convenience, and so has some advantage to recommend it. Whether on the question of economy the developer will be acceptable to professional workers, who have to count the cost of every item so closely nowadays, I cannot profess to judge, but to amateurs, with whom such considerations are not so paramount, I believe it will be most valuable; and I wish to thank Mr. Platt for so kindly bringing it into notice, hoping in return that this commentary may be of some service both to him and to other readers of the Almanac.

SUBSTITUTE FOR GLASS TRAYS.

By Professor E. Stebbing (Paris).

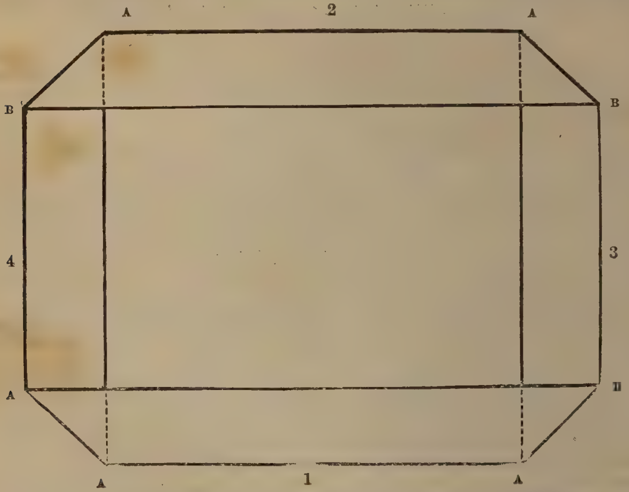
Amateurs and photographers know the inconvenience of glass dishes, or wood and glass trays; the former so easily broken, the latter requiring so much care to prevent leakage. For the last year I have completely discarded such trays from my laboratory, and replaced them by a series of zinc trays, which are so made as to enter one into the other, so as to occupy no great space. The varnish I employ is easily made and holds firmly upon the metallic surface; the trays covered with this varnish will resist nearly all the solution employed in positive and negative photography. It is made as follows:—

Pulverise bitumen and put it into a large-mouthed phial, containing—

Pure benzoline	3 parts.
Turpentine	1 ,,

Put the phial into a saucepan containing warm water, place the saucepan on the hot hob (away from the fire), stir up with a glass rod until the bitumen be dissolved; add the latter until the required thickness be attained. When cold, the metallic trays are covered over with this varnish by the aid of a brush. If the varnish be too thick it can easily be liquefied by adding a little benzoline and turps; the latter is only to prevent its being too brittle.

I give a design of the form of the tray. Sheet zinc is now so easily procured of any thickness, and is so easily worked and soldered, that any photographer can make these trays himself.



Procure the zinc of the size required for the tray, cutting off the angles as shown in the above design, taking care to slit the zinc at the dotted lines A A A A. The four sides are now turned up, beginning by No. 1 and finishing by No. 4. The angles are now bent round at B so as to lay flat against the longer sides of the tray, and will give strength and solidity to the tray when soldered. If *very large* trays be wanted galvanised iron must be used, when, covered over now and then with this black varnish, they will last for years.

To cure blistering of albumenised paper: Add a certain quantity of alcohol to the silver bath; this will coagulate the albumen and prevent blisters. If in hot weather this does not completely check their appearance, pass the proofs, before fixing, through a solution of common salt.

TRANSLUCENT PAPER NEGATIVES.

By Rev. H. B. Hare.

During the early autumn, when salmon fishing in Wales, it was my good fortune to come across a friend distinguished at the same time for the rod and the tripod; and it being a nice genial day, and the sport not quite fulfilling our morning's expectations, about one o'clock we sat down on the banks of the river to refresh ourselves with the luncheon that we had brought with us, and chat over that fascinating art-science which we knew would be a mutual subject of interest to both. After a long discussion on the different merits of paper *versus* glass, and many other matters connected with photography, our attention was once more turned to the craft we were that day more immediately engaged in. My friend prided himself particularly on the excellency of a certain composition which he made for dressing his salmon lines; and on *fishing* out from him what the ingredients were, it occurred to me that, if one of the items were omitted, it was *the very thing* for rendering paper negatives translucent. When I came home I tried it, and am more than pleased with the result.

The receipt is as follows:—To make eight ounces: Place in a wide-necked bottle or jar—

White paraffine wax cut up in small flakes	6 ounces.
Petroleum	2 ,,

Dissolve with heat on the hob, or, better, in a saucepan of hot water. Apply cold, with a piece of rag, on to the back of the paper; hold the negative to the fire for a minute and then place it between two thicknesses of blotting-paper; afterwards press in a book.

TWO 'DODGES.'

By J. W. Lapham.

Having seen some time ago in The British Journal of Photography a question as to how unmounted prints could be made flat and glossy, a plan which I have adopted may be of use. It is to roll the prints in an ordinary rolling press under a thick card mount, which has been well rolled previously to harden it. The press should be very hot, and the effect produced is nearly the same, so far as the gloss is concerned, as if the prints had been mounted.

As before photographs can be rolled it is necessary to *print* them, and with albumenised paper this sometimes results in blistering of the prints and consequent bad language, perhaps the following little 'dodge' will be found to prevent, in many cases, these deplorable events. When the prints are completely fixed, dilute the hypo gradually with *slightly* warm water, pouring out some of it before each addition of water. Then remove the prints to a pan of tepid water and allow them to remain in that for a little time, after which the washing can be proceeded with in the ordinary way. For many years I have treated my prints in this way, and have always found it most satisfactory.

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CHEAP, SIMPLE, AND EFFECTIVE REDUCER FOR GELATINE NEGATIVES.

By H. Hall.

It sometimes happens, either from prolonged forcing with ammonia or other—sometimes unaccountable—causes, that negatives of such exceptional density are obtained as to be altogether beyond the reach of those reducers which depend for their success upon chemical action. The following simple method will effectually reduce, no matter how dense the negatives may be:—

Dilute ordinary chloride of lime with half its bulk of water and immerse the negative; in about twenty seconds, depending on the quality of the gelatine, the film will have acquired a slimy condition, which can easily be ascertained by the touch. Now remove from dish, and with the finger or soft pad gently and evenly rub down. The density can thus be reduced at will, a final wash completing the operation.

The advantages of this reducer are: first, its cheapness; second, its effect being physical, not chemical, local reduction can be carried to any extent; third, however far the process is prolonged, there is not the tendency to 'frill' which characterises the acid reducers; finally, this is not a theoretical reducer, but one that is standing the test of repeated demonstration.

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RELIABLE DEVELOPMENT AND TONING.

By Chas. J. Hall.

After considerable experimental work, with the view to obtain reliability in the development of gelatino-bromide plates and also the toning of prints therefrom—two of the most exacting departments in successful photography, especially with regard to the amateur—we have adopted, during the past year, formulæ of very simple and yet satisfactory character.

To present a statement of our procedure *in extenso* would unnecessarily occupy your space. We might, however, be permitted a passing remark in regard to the popular English developer—the ammonia treatment. For some time our chief objection to its use has been its uncertainty after long standing. Only to users of considerable quantities, freshly made, can it be admitted as reliable. Even then, in our opinion, it is open to doubt. Indeed, it may be accepted as an axiom where ammonia is used, united with the most careful manipulation, that scarcely two negatives can be obtained possessing equal uniformity. This is due largely to the volatile nature of ammonia and its consequent loss of strength. The more delicate differences of development are attested rather by the character of the resultant prints than in the negatives themselves, simply from the fact that the more subtle shadow effects are more manifest in the positive than in the negative form. On this ground, therefore, we are inclined to believe that the ever varying condition of the ammonia developer is largely responsible for incorrect representation of shadow. We do not care to trust even to our stock ammonia, and it is our firm conviction that, as a reliable developer, its best days have already passed.

It is with no little pleasure, therefore, we commend your readers to the increasing importance of the sodic-potash developer. We wish to add our testimony to its great value. The result of our past year's experience gives the following as the most suitable proportions for the plates of leading makers:—

SODIC-POTASH DEVELOPER.

A.

Carbonate of soda (dried)	2½ parts.
Sulphite of soda	1 part.
Water	10 parts.

B.

Carbonate of potash	2½ parts.
Sulphite of soda	1 part.
Water	10 parts.

For use, take three grains dry pyro with two ounces water, then flood the plate with same—having previously soaked it in water only—and allow it to stand for a minute; afterwards add one drachm each of A and B for ordinary exposures. With time, the plate will work up to any density required without further additions. To regulate under and over exposures it is simply needed to bear in mind that whilst A gives density, B secures detail, so that the proportions must be altered to suit requirements.

This developer not only gives uniform results but it is clean, not offensive to the nostrils, and, what is better still, appears unalterable in point of activity. As an instance of this, we have had solutions made up nearly a full year, and opened continuously for use, and yet they are as vigorous as ever and yield equally as good negatives as when first made up. This much few will claim for the ammonia developer.

AN EXCELLENT CLEARER.

Chloralum	1 part.
Water	2 parts.

This clearer works admirably. It is the best we have ever used, and we are not aware that it can be surpassed by any of the nostrums hitherto announced. After fixing and slightly rinsing the plate, flow over the above and return to the bottle. It instantly removes any discoloration, and gives perfect shadows.

CARBONATE OF POTASH TONER.

C.

Carbonate of potash	1 part.
Water	4 parts.

D.

15-grain tube of gold chloride.
15 drachms water.

After mixing and well stirring solution C, allow it to stand until clear, then filter and bottle for use. All that is now required for toning is to take forty minims of C to each drachm of D, and mix with ten ounces of water, and the bath is ready for use. This will comfortably tone one sheet of ordinary sensitised paper, and must be freshly made, although we have used it a second time, slightly strengthened, to advantage. Still, this is not needed.

The advantages of this toning bath are:—1. Its readiness and simplicity in making; 2. Its permanency of character, the solutions remaining unchanged; 3. Its reliability of tone, that of a warm sepia. Of course, other tones can be obtained at will by it, but not so easily nor yet so rich in bloom. It should be observed that the prints must not be so deep as for the acetate bath, and the toning must be allowed to assume a purplish blue before transferring to the fixing bath.

To conclude, we simply wish to remark that whilst we offer 'nothing new under the sun,' still our mode of procedure to obtain the most reliable and satisfactory results may be somewhat out of 'the beaten track,' and, if followed, will assuredly help many out of a series of annoyances and difficulties into an atmosphere of comparative ease and safety.

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DEVELOPING, INTENSIFYING, AND REDUCING.—STRIPPING FILMS, AND OTHER MATTERS.

By G. H. E. SUTTON.

THERE is one peculiarity about gelatine dry plates that is very perplexing, and ofttimes causes serious annoyance to the operator, and that is the differing behaviour of different batches, but especially those that have their origin from various manufactories. When I speak of differing behaviour I mean as regards their action under the influence of the solutions brought to bear upon them—the developer, the intensifier, and the reducer.

When wet plates were in use these difficulties were practically without existence. Whatsoever make of collodion was in requisition, the same formula for developer and intensifier was used without trouble and without any thought of modification; but under the new *régime* this is often a thing of the past.

Ordinarily I use but two brands of plates, which for convenience we will call A and B. During the past summer I have used a quantity of both; those from A in two several batches, the first of which would not bear the developer according to the formula supplied with them, but gave splendid results when it was reduced to half the strength; the second batch were directly to the contrary, being comparatively worthless as regards printing quality until the developer was restored to its full strength.

These are very awkward things, especially in a busy time, for it is not always that the fault is run to earth and laid bare after the first trial.

In intensifying I noted that the two makes, A and B (that is to say, from the two separate manufactories), behaved in opposite directions. A gave good results with mercury followed either with ammonia or sulphite of soda; B would only act when the mercurial treatment was followed with ammonia, sodic sulphite reducing the image to its former weakness, and the longer it remained in contact with the film the more it was reduced, so that really what in the case of the brand A acted as an intensifier, in the case of brand B became a reducer. Similarly, in the reduction of density, cupric chloride would reduce A almost to bare glass, ferricyanide of potassium still more effectively the same; but in the case of B scarcely if any effect was noticeable under the action of the cupric chloride. No wonder that we hear of such diverging experiences, or that one casts aside with disgust what another has recommended as a panacea for some grievous ill. I have had negatives completely ruined both with ferricyanide of potassium and perchloride of iron, both of which have had their merits applauded as being the pink of perfection for reducing purposes. But then so it is that gelatine dry films in these respects remind one of the old adage—'What is one man's meat is another man's poison.'

It may be worth while to note that ferricyanide of potassium (of course, in combination with hypo) is also recommended as a perfect reducing agent for silver prints, with the additional qualification that the tone of the proofs is not altered, as is the case when cyanide of potassium is used for that purpose. My experience of it has been contrary to this. Its action as a bleach is unquestionably perfect, more so I think than the cyanide. Proofs literally black, and others but slightly too dark, gave way under its influence, leaving the delicate half tones in harmonious balance, but as blue in colour as any over-toned prints could possibly be.

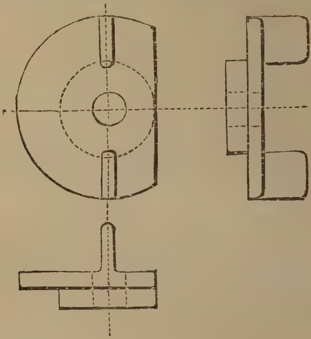
Mending Broken Trays.—I had two porcelain dishes which had pieces broken out of their sides, thus being rendered useless. I cemented them together carefully with gutta-percha, keeping the pieces in position until set, as they had a knack of sliding off. They have been in use to the present time, and seem to be practically as good as when new, notwithstanding that one of them is commonly used for holding silver solution.

Stripping Gelatine Films.—I never find myself in any difficulty in the stripping of gelatine films. The most obdurate, under ordinary treatment in development and finishing, have given way with a little gentle coaxing after being placed in a *strong* bath of citric acid and chrome alum, with the acid in excess. In some instances the films thus treated, when removed and placed under the tap, washed off the glass into the sink, as a collodion film was occasionally prone to do. But this very day I have in this manner stripped four negatives most successfully, and I may mention as a singularity, which I have not previously noticed, that in one case there was left upon the otherwise bare glass a perfect positive picture of the lady that had been photographed upon it, faintly visible by refraction, but clearly visible even in the half tones by reflected light. This I have preserved as a curiosity.

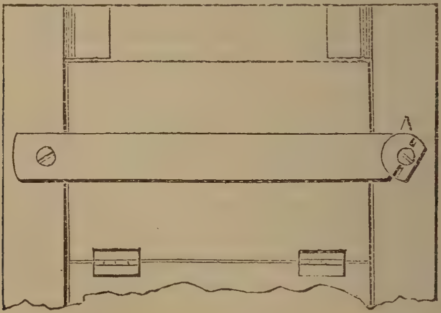
BUTTON FOR COMMON PRINTING FRAME.

By Zachary H. Kingdon.

Those who—and probably they are many—use the 'common ordinary or garden' printing frame, in which the pressure is produced by flat metal springs spanning the width of the frame, being held at one end by a screw, round which the spring can swivel, and at the other by a wire staple, will probably have met with two difficulties which have given me some trouble. The first and most important is that the print often gets shifted when pushing the spring back into its place, and is thereby spoiled; the second is that by constant use the screw at the fixed end of the spring gets loose and comes out. Both these evils have a common cause, namely, that the spring has to be swivelled into position *whilst the pressure is on*, and I have effectually removed both in the following simple way:—



The wire staple is done away with and a brass button, shown in its place at A, supplied in its stead. This button is held in place by a round-headed screw, around which it can freely turn, and is shown in



detail, of the size I have used for whole-plate and half-plate frames, by the three full-sized views. The buttons are cast in brass, the only necessary work on them being the drilling of the hole for the screw, and being very light in weight (about thirty-six to the pound) they cost at the rate of about a halfpenny each, though, of course, they may be turned, filed, and polished to taste.

It will be seen that by using these buttons the swivelling of the spring into position for closing the frame can be effected before the pressure is put on, and the swinging out of the way for opening the frame for examination of the print after the pressure is released, thus at once removing the common source of the two evils referred to.

The pressure necessary to ensure contact between paper and negative in frames smaller than half-plate is probably not sufficient to cause much trouble, but in the larger sizes it is.

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PHOTO-MICROGRAPHY WITH A MICROSCOPE OR A CAMERA.

By T. Charters White, M.R.C.S.

When an idea becomes imbedded in the mind of an enthusiastic believer it becomes, as it were, fossilised there, and all the difficulties which oppose themselves to the elaboration of that idea fail to dig it out, but form stimuli to further exertion. That one idea has taken possession of my mind, and it is this: that by the co-operation of other minds equally enthusiastic, photo-micrography may be made more of a success than it even is at present. This must be my apology for again intruding upon the readers of the Almanac the subject which, of all others, has formed for me such a subject of interest during the dark evenings of now three winters, and which each succeeding winter finds undiminished in its fascination.

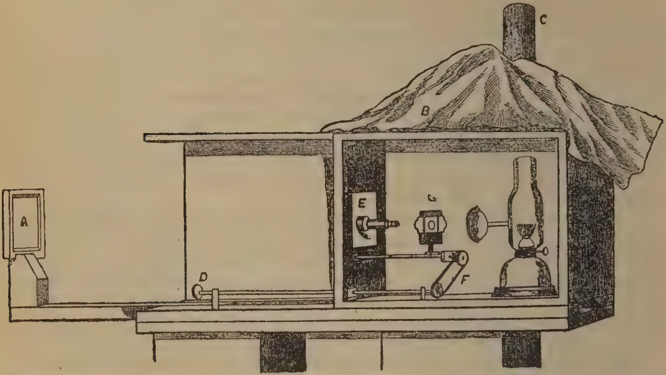
Photo-micrography, to be successful, must be approached by easy stages; it is of very little use to plunge *in medias res* by employing high power objectives before the comparatively simple routine of taking a photograph with a low power has been mastered; and simple as this routine is, there are difficulties which present themselves at every turn, but by careful attention and experience they can be overcome and the operator rewarded with a satisfactory result.

In photo-micrography we have the converse of micro-photography, which is applied to the making of such small photographs as to require the aid of the microscope to render them visible, while photo-micrography is applied to the portrayal of microscopic specimens by photographic enlargement. My reason for mentioning this distinction is to correct a tendency very generally prevalent that these terms are mutually convertible and may be used with indifference.

Photo-micrography has been practised many years, but I have not thought it desirable to swell the dimensions of this paper by giving a full history of its rise and progress, but for those of my readers who may feel interested in working out this history, I may say that Dr. Lionel S. Beale, in his valuable book, *How to Work with the Microscope*, 1865, states that Mr. Dancer, of Manchester, produced photographs of microscopic objects about 1840. From that time forward various workers in this field of science, both in America and England, have taken it up with increasing satisfaction in the success of their results. It is to be regretted that the records of their labours are too scattered up and down throughout the literature of science to permit of my searching them up and bringing them within the compass of this contribution.

In all the processes described, the microscope has been employed in conjunction with the camera, and beautiful results have been attained thereby; but while fully admitting this, I have never felt satisfied with the constricted field of view produced by the microscope tube; therefore, in the method I wish to introduce now, I discard the use of the microscope entirely, the advantages I claim for this being —first, the field of view is only limited by the size of the sensitive plate employed, a great range of amplification is obtained by varying the distance between the objective employed and the sensitive plate, and an amplification suitable to the subject can be easily selected. A second advantage derivable from my arrangement is in the ability to see your image and arrange it according to the part you desire to photograph: this can be done on the ordinary ground focussing glass of the camera, as you are aware, but when the image is thrown on to a white ground, as it is in my apparatus, it is more easy to select any particular portion and to focus it roughly. This method is only suitable for photographing transparent objects, but as it is more immediately designed for the delineation of histological subjects, nothing can exceed its adaptability to do this in comfort and ease.

Before proceeding further, it may make my remarks more readily understood if I briefly describe the photographic arrangement I employ.



A—Frame for receiving sensitive plate and focusing screen. **B**—Black velvet curtain for shutting in the light. **C**—Chimney. **D**—Handle of focusing rod. **E**—Sliding plate for changing objectives. **F**—Endless band acting on fine adjustment of **C**—The object carrier

Imagine an oblong, lidless box, laid on its side, and securely screwed to one end of a baseboard, two inches in thickness, and two and a half feet in length; the upper central part of this baseboard, about one inch in thickness, is made to slide in a dovetailed groove—the end of this sliding part carries the holders for the plates employed—this holder being an ordinary printing frame, in which photographic negatives are printed from. I vary the size of the holder according to the amplification I require, and by means of this sliding holder can diminish, or greatly extend, the magnification as may be desired. The upper side of this box has an oblong opening cut in it over which a tin chimney is fixed, thus allowing my lamp to approach or recede from the object stage as may be desirable. Another opening is made in that side of the box which faces the plate holder and central with it; this opening is closed by a movable brass plate, having an adapter with the standard microscopical screw soldered into it: this permits any objective with the Society's screw-gauge being employed. Below this plate a support carrying the movable stage is fixed to the side of the box, this stage being moved backwards and forwards by a long micrometer screw; the subject to be photographed is made to approach or recede from the objective till a sharp image is thrown on the screen; the best focussing screen is made by covering an old glass plate of any of the standard sizes intended to be employed, by gumming on a sheet of the smoothest white paper, this enables the operator to arrange the object according to his judgment, and permits of a certain amount of rough focussing. The finest focussing must be arrived at by other means; another plate of plain glass put into the holder, having *fine* lines drawn a short interval apart with a writing diamond on the surface of it, which faces the objective, is looked at from the back through an ordinary eye-piece or a photographic focussing glass, and when the details of the objects are seen sharply at the same time as the fine lines, a sharply defined image will be thrown on the sensitive gelatine plate, which it is intended shall occupy in the holder the place now occupied by the plain glass.

The light is derived from a microscopical lamp, burning the purest paraffine oil, in which is dissolved a lump of camphor of the size of a walnut to the ordinary reservoirful; this whitens the flame and renders it more actinic; a plano-convex lens, with the convex side towards the flame, serves to concentrate the light on the object. A curtain of black velvet falls over the front of this arrangement, shutting all light in, and a shutter cuts off the rays coming through the objective till all is ready for them to fall on the sensitive plate during the proper time of exposure. Now this is, in brief, a short description of the apparatus I employ, and it next demands a few directions relative to the *modus operandi* practised.

The lamp having been lighted and placed inside the box is allowed to burn some short time before commencing work that the wood and brass work may be warmed up, for if this is not done the expansion of these after you have focussed your object will result in a blurred picture. Your microscopical slide may next be placed in position, and its projected image arranged on the white paper surface of the focussing screen. You will soon learn to see by the character of this image whether it will require a long or a short exposure, whether it reveals much detail or is marked by its entire absence, or whether its colour favours photography or not; if the object or its image possesses detail of a fairly well-marked character, and the object is not too thick, you may calculate upon getting a successful result if you give the *correct* exposure, and now you are brought face to face with the first of the difficulties.

A most valuable paper on photo-micrography by lamplight may be read in Nos. 13, 14, and 15 of The British Journal of Photography for 1885, written by an accomplished American optician, Mr. W. H. Walmsley, and which I strongly advise those interested in this subject to read; it is most succinctly and clearly written, and contains the whole gist of the subject. In the matter of normal exposures by lamplight, he gives the following table, which may be taken as approximating to the correct, but may require modification by each operator. When using

$1\frac{1}{2}$ inch objective	3 to 45 seconds.
$\frac{2}{3}$,, ,, ...	7 ,, 90 ,,
$\frac{4}{10}$,, ,, ...	$\frac{1}{2}$,, 3 minutes.
$\frac{1}{5}$,, ,, ...	2 ,, 7 ,,
$\frac{1}{10}$,, ,, ...	4 ,, 10 ,,

In working out this branch of photography I have had no help from books or friends, and my experience tallies exactly with that of Mr. Walmsley, and I can fully endorse all he recommends.

Having selected your objective and focussed your image, cut off the rays of light from the screen and shut in every vestige of light. Now, being in perfect darkness, light your non-actinic lamp; these are sold of various patterns, but may not be actinically safe, as I have found to my cost upon several occasions. That I use is a paraffine lamp with all light blocked out through the reservoir, an Argand wick, and a tubular chimney, well coated inside and out with Thomas's ruby varnish; this will afford abundance of safe light at eighteen inches distance. By this light take your sensitive plate from its box and put it into the focussing frame, when its gelatine surface ought to be in exact register with the fine diamond markings by which you get the true focus; then open your objective and let the image of your preparation fall on the gelatine plate for the number of seconds or minutes given in Mr. Walmsley's table, after which shut off the light again and proceed to develope. I need not say much on this subject, because it has been very fully treated in all the elementary books on photography. Some operators prefer the ferrous-oxalate developer, while others adopt that which is known as the alkaline pyrogallic acid. I have used both, and although I have got very good negatives with the pyrogallic acid, I prefer the ferrous oxalate, because it does not stain the fingers.

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AIDS TO DEVELOPMENT.

By John Jackson.

In developing dry plates I have for some time been in the habit of using a large *round* camel-hair brush with which to go over the plates during the process, and I find much advantage in its use, not only as a preventative of air bubbles, which are a continual source of trouble if great care is not taken to disperse them before the action of the developer starts, but also as an important assistance in the process of development. By its judicious use local development can be made, and parts which from the nature of the subject require forcing can be brought out by the application of the brush charged with dilute ammonia to such parts, the plate being still in the original developing solution.

Again, in the washing of the developed plates the brush is of great service; my practice is invariably to brush the negative well while under the tap and before putting it into the fixing bath, the mechanical action on the film removing the developer left on the plate very quickly and efficiently. After fixing and the alum bath, I find rubbing the film while under the water tap of great use in removing any stains, green fog, and hypo; but at this stage, instead of the brush, I find it better to use a bit of clean soft sponge, which has been carefully freed of sand and grit, applying it to the surface of the film with a firm yet careful pressure and rubbing the plate all over with a circular motion, allowing at the same time a copious flow of water from the faucet to descend on it. After this rubbing treatment the still wet negative appears to be all scratched over its surface, but when dry all these marks disappear.

◆

'ADVOCATUS PRO DIABOLO.'

By Marston Moore.

My client is the commercial maker of dry plates. Throughout the entire universe of photography there is nobody who has such need of an abnormally broad back as that same much-maligned manufacturer, nobody with such a leviathan load to bear. To decide why and wherefore would, I fear, involve the exercise of a far subtler casuistry than that at the command of the present scribe. Doubtless there is a reason and an explanation for and of the odd phenomenon, but I should be very sorry to embark upon the voyage of discovery—in my view that is exactly one of those things readily capable of consignment to the good offices of a beneficent future. For the purpose of the moment, let it be supposed that the brace of facts inferred in the second sentence of this paragraph passes unchallenged—except by a few dyspeptic adherents of the 'old collodion' era and some other Rips of a cognate kidney—let this be supposed, and the preacher can pound away at his text with a superfine belief in its appositeness.

To dilate upon the peculiar difficulties of atmosphere, temperature, and other fickle elements, and the variations and uncertainties in the quality of his materials with which the conscientious dry-plate maker is surrounded, would be entirely supererogatory. They are known and appreciated by every old photographic hand; the new men are not, of necessity, so well versed, and it is solely against them that I am arguing, not, I venture to assume, without some cause.

I should be sorry to insinuate, or believe, that defective plates never escaped the hands of their makers. These gentlemen are more or less dependent upon the literal fidelity and intelligence of their subordinates. I wonder how many of us who have successfully exposed and developed a really good plate ever pause for a second to think that of the score of hands through which it has passed each one has faithfully fulfilled its trust, from the young person who cleaned the glass, on through the list of emulsion makers, coaters, packers, to the bland individual who retails the neat card box across the counter and murmurs something about discount for a quantity, &c. Photography is now fairly established as a knifeboard or railway-carriage topic, on a par with tennis and other namby-pambyisms, and suburban London on a Monday morning infallibly delivers itself of certain terse sapiences of which the following may be accepted as an average sample, in the full belief that it is simultaneously floating out of the carriage windows at all points of the railway compass:—

'What did you do with yourself yesterday?'

'Exposed a couple of plates on the dog.' Or 'the girls.' Or 'the wife.' Or 'the slavey.'

'Get anything?'

'Deuce a bit. Had the beastly plate in the developer for half an hour, too.'

'What was the matter with it?'

'Fogged, sir; insensitive, and all the rest of it.'

'Whose plates do you use?'

'Trock & Platten's.'

'Ah! there you are, you see. They're not worth a rap, sir.'

And so on.

I'm afraid this is far from edifying, but it points a moral. A bad workman—never mind the rest. Indisputably photography has more bad workmen than good ones. That comes of reducing the camera to the level of a fashionable scientific toy. But our professional friends are just as great sinners as their amateur brethren. In ninety-nine cases out of a hundred the first thing that occurs upon the discovery of fog, spots, dirt, air bubbles, frilling, or any of the numerous ills to which the plate is heir, is the despatch of a letter couched in something like these terms:—'Messrs. Trock & Platten. Dear Sirs,—The last plates you sent me were very bad. My operator says . . . .'

Oh, that operator! I never heard of but one photographer (he bears an honoured name) who, when things went wrong, said to his dry-plate makers, 'Now, Messrs. Trock & Platten, the plates seem unruly; who's in fault, you or I?' That man deserves a statue.

Of a somewhat different cast of mind was a large provincial consumer of dry plates upon whom Messrs. Trock & Platten's representative called.

'I can't get on with your plates at all.'

'I'm sorry for that; let me develope one, will you?'

'Certainly.'

Five minutes afterwards: 'They work very nicely in my hands,' quoth the representative of Messrs. Trock & Platten; 'what developer do you employ?'

'Pyro . . . . and *iodide* of potassium.'

Since I have drifted into discursiveness perhaps I had better so continue to the finish of what I had intended to be a somewhat more academical defence; but the end justifies the means. I want to absolve the maker of dry plates from a few of the sins that are thoughtlessly and unjustly laid to his charge. At the present time he stands more in need of our sympathy than ever he did. The cruelly 'cutting' tactics adopted in regard to price render it doubly difficult for Mr. Trock or Mr. Platten to put a sound and reliable plate on the market at the current figure, and yet it is self-evident that if he does not his occupation soon departs. Few reflect that it is impossible for really bad plates to hold their own for more than a couple of revolutions of the mercantile clock; their good or bad qualities are settled at the moment of use, whereas in the instances of nearly every other article of commerce—furniture, pianos, watches, picture frames, clothes, &c.—time alone can demonstrate their worth or the reverse. I commend this small fact to the photographic neophyte who swaggers about attempting to mar the reputation of those of whose troubles and trials he has little or no conception. Another anecdote.

'Do you know,' wrote one of these gentry to Messrs. Trock & Platten, 'what rubbishy plates you are sending out? Here are two that I've just developed. What do you think of them?'

'Expose another plate and let *us* develope it,' responded Messrs. Trock & Platten. The soft complainer did so; the plate was developed into a perfect negative.

'Dear me!' muttered the now apologetic amateur; 'I—I—I'm very sorry; I can't understand it.'

Such soreness between maker and consumer exists nowhere else but in photography, and then only in regard to dry plates. Quarrels with lens makers, apparatus makers, chemists, are far less bitter and heated than with the poor dry-plate man. He is the universal scapegoat. Why? I must leave the answer to futurity. I know a very eminent authority on the Alpha and Omega of the entire photographic art who once reviled his plate maker with cruel acidity.

'Every plate out of six dozen I had of you last month were hopelessly fogged before exposure; I can prove it by chemical demonstration.'

And so he did; but the dry-plate maker proved that his (the eminent authority's) camera let in the light.

'Oh, ah!' quoth the eminent authority, 'I never thought of that!'

What with those who 'can't understand' and those who 'never think,' I believe it will be generally admitted that the man who makes and sells dry plates in pursuit of his daily bread has need of a big stock of patience and complacence. I have not treated my subject with the customary heaviness, and I rely more upon my anecdotes than upon any special pleading of my own to prove the contentions contained in the hereinbefore mentioned second sentence of the first paragraph.

DEVELOPING ROOM ILLUMINATION.

By W. H. Harrison.

Having during the past year seen in certain photographic establishments on the Continent, and heard that in many similar establishments in England ruby light is still used, so that one has to grope his way step by step in their workshops as though a prisoner in a dungeon, again do I return to the subject in these pages of the theoretical and practical error of that method of illumination.

Although there is a steady variation in wave length from one end of the spectrum to the other, although the yellow rays excite our nerves of vision so much more than any of the rest, and although there is no correspondingly increased action upon the sensitive salts of silver in the yellow, the old error of not utilising the physiological peculiarity of the human eye in relation to those rays still prevails. It has been argued that by raising the intensity of the red light to that of a particular intensity of yellow there is the same strength of light by which to work, and with greater safety—which is the reverse of fact. This argument for escaping the difficulty would moreover, if admitted, destroy the trustworthiness, as applied to developing room illumination, of all the engravings printed in photographic books of the action of the spectrum upon salts of silver, for if you increase the intensity of the red many times beyond that given by the rest of the spectrum, to excite the nerves of vision as much as the normal yellow, the normal photographs of the said spectrum obviously deceive rather than give information. A few days ago I saw dozens of yards of transparent paper covered, at Mr. Vergara's works, with an exquisitely sensitive emulsion, in a yellow light in which the workmen could fairly see what they were doing, whereas in the red light of M. Beernaert's works at Ghent I had a short time before been groping in comparatively Egyptian darkness.

The few who have tried yellow light and then gone back to red do not appear to have mastered the conditions of the problem. When they employ daylight as the initial source of illumination they are certain to fail, because to use a light which hour by hour or minute by minute increases or decreases in intensity by multiples of scores, is as irrational as to use a developer of one strength upon one plate and a developer of fifty or a hundred times the strength on the next plate, yet to expect the same result.

Another cause of failure is that the operator piles layer upon layer of yellow paper, and when he obtains with his uniform artificial light but about the same amount of illumination he had formerly with the red, he exclaims, 'That is a safe light.' So it is, but of what advantage to him? If he prefer a red colour he goes back to it, he having made it but a matter of liking or disliking a particular colour. In securing the habitual darkness of his room his old habits cleave to him, just as poor little silkworms when afflicted with the disease which some years ago devastated the silk industries of France, went through their habitual spinning manipulations with their bodies although they had no silk to spin.

Others, again, are not particular as to the yellow they use or the amount of optical continuity of the fabric employed; the superposition of various layers, it is true, masks the latter defect. A very bright yellow closely resembling that of the sunflower is the right one; it must not be an orange-yellow, because when the orange part of the spectrum is approached the region away from that of the highest physiological sensitiveness of the eye is entered.

For practical working details my communication to these pages last year may be consulted. Suffice it to say now, that if a lantern window a foot square be screened with three *dry* sheets of yellow tissue-paper simply laid over each other, with the light of a candle shining through them, and the photographer then try at what distance in front of the screen it is safe to develope a plate of a particular sensitiveness, he will be surprised at the amount of light by which he can work. The candle must always be at exactly one fixed distance behind the screen—say nine or ten inches—otherwise considerable working variations will result. It is not necessary to test the yellow of the tissue-paper with the spectroscope, because the screen being translucent and not transparent the three thicknesses of masses of interlaced cellulose fibres intercept on their own account enough of the fainter blue and violet rays which might otherwise be transmitted by the use of a yellow not optically pure.

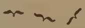
The adoption of a scientific method of developing room illumination will be found to take a weight of daily misery off the bodily organisation of the photographer, and through the body the beneficial influence will react upon the mind.

ON CROWS.

By Richard Keene.

And what have crows to do with photography, whether *Corvus corone* or *Corvus frugilegus*, or any other bird of the same genus? Of course there are divers kinds of crows, but we will *bar* all others and speak only of 'the large black carnivorous bird that makes a croaking noise' and his cousin who robs the cornfields, together with another thievish relative, *Corvus monedula*. My excuse for introducing these sable friends to notice is that I have never seen them named in any of the photographic handbooks with which I am acquainted, and in having found them very useful auxiliaries for a great number of years, in fact, since the time I first printed a landscape on albumenised paper. It is only too well known that, however careful the photographer may be in touching out blemishes in the skies of his landscape negatives and spotting the numerous constellations of pinholes which often congregate there, he will sometimes get little black spots on his prints where all ought to be

> 'So cloudless, clear, and purely beautiful.'

Here it is that the crow, rook, or jackdaw, comes in to hide the blemish, and, more than that, to give life and interest to the picture; for nothing is easier than converting the black dot into a conventional crow by two little touches of the brush, something like this , which is called in printers' parlance a 'brace.' Plenty of such crows may be seen in Bewick's delightful vignettes. Now as crows are sociable birds and seldom seen alone, it is advisable to give your first crow *one* companion, at least, though you may not have two spots to hide, and where a *brace* of crows will not satisfy the requirements of the case, add as many as you please, so long as they tend to hide defects or improve the composition. I have fancied a scene where the landscape occupied little more than a third of the picture, a scene with some distance in it, vastly improved by the introduction of a long flight of crows, the nearest of decent proportions, and as they receded getting small by degrees and beautifully less. In this landscape, 'near those tall elms,' a few flying *braces* at different degrees of inclination may be fitly dabbed in; over that distant and tree-covered hill, where a beautiful haze hovers, are two or three nasty little specks—either tear up the print or paint in your crows, and don't be afraid of putting in one or two *between* you and the trees, that is, below the sky-line; if done artistically they look so real and add to the atmospheric effect. An old ruin or a church tower afflicted with a specky firmament may as well be improved by a few jackdaws 'wheeling their airy flight,' and so on. Sometimes these photographic flaws occur on sheets of water—try your hand at swallows skimming over its surface; this is not quite so easy, nor always so admissible. In coast scenes and sea pieces,

> 'Where the sea-gulls toss and shriek,'

put in gulls and imagine the shriek. Crows, however, should not be added without cause, but only as a help to rook others in an innocent way.

There is nothing more to add, save hoping these ornithological remarks may be useful to some of my brethren in inducing them to save their spotty prints by hiding their defects under the wing of the crow, or some other bird.

WILLESDEN PAPER FOR PHOTOGRAPHIC USE.

By Baynham Jones.

I was much interested in the exhibit at last year's 'Inventories' of the capabilities of the Willesden paper, which comprised, *inter alia*, lifeboats and other vessels which require not only to be waterproof but at the same time to combine great strength. I was, however, surprised and disappointed at not finding photographic dishes, funnels, and other photographic requisites in the stall. I concluded that these matters had been overlooked by the manufacturers, and that I should in the course of a few weeks find all the photographic stores filled with them.

Some thirty years since I visited Messrs. Jennings & Betteridge's *papier-maché* manufactory at Birmingham, for the purpose of having some dishes made for the calotype process which I was then working, and from what I then saw I was greatly impressed with the idea that *papier-maché* must shortly, to a great extent, take the place of wood, metal, and earthenware. Messrs. Jennings & Betteridge made me some excellent trays up to 15 × 13 inches, and these (with the exception of two which have been broken by falling on a stone floor) are now in use. As most of your readers are no doubt aware, *papier-maché* articles are made by two processes, the one being paper pulp cast in moulds, the other of sheets of paper pasted together and while damp pressed into shape. Tea trays and similar articles are made by the last method. On removal from the moulds, the articles are stoved under a considerable amount of heat (after having been coloured and varnished), and this process renders them rather brittle.

The material may be used for many purposes after being simply dried, and in that state it is very strong and durable; it is not, however, waterproof, but this defect may be easily remedied by coating with shellac varnish, or, if preferred, by painting and polishing in the same way as the panels of carriages are done. The latter process not only renders them waterproof, but they resist the action of nearly all the chemicals used in photography; concentrated cyanide is almost the only thing I am aware of which will act injuriously, and that only to the extent of dulling the varnish. The material after simply drying is capable of being planed, turned in a lathe, screwed and dovetailed, and it decidedly has the advantage over wood both as respects strength and lightness. I have some pieces nearly an inch thick, and as hard as a board.

If some of my readers are camera makers, I should strongly recommend them to make a trial of the Willesden paper, which I imagine comprises all the good qualities of *papier-maché* with several others in addition, and I feel assured that the result will be very profitable, at any rate it will not waste much time nor money if unsuccessful. There is another advantage I have forgotten to name, which is that the paper is not liable to warp, and slides made of it are not likely to stick fast as wooden ones frequently do.

RETOUCHING DESKS.

By W. H. Hutton.

In the course of my wanderings it has been my fate to be brought into very intimate contact with all sorts and conditions of desks, ranging from the elaborate machine of Messrs. Burrows & Colton to a fearful structure made of old boxes. The majority seem to be made on the grand old principle of how not to do it, for they are about as unsuitable as is well possible.

The comfort of the worker is the last thing thought of, though it must have a great influence on the quality of his work. A rickety desk is, in some places, evidently looked upon as an essential. Indeed, I have known some wrecks that you hardly dare breathe on lest they totter and collapse, while to sneeze in their vicinity was fatal. Hinges with but two screws to the pair, supports of unequal length, dislocations of the joints of the frame, and a general aspect of decrepitude, convinces the beholder that the veteran lags too long upon the stage. But it keeps on lagging.

On going to a fresh situation, the retoucher is introduced to what is by courtesy called the retouching desk, which is frequently situated in some odd corner 'out of the way'—anywhere will do, but the odder the corner the better. The conditions of light, &c., may, or may not, be suitable. If the corner be dingy, the cheerful wielder of the pencil must make light of it.

To sit in a draught strong enough for an average blast furnace is the lot of many retouchers. Some are draught proof and stand it; others, who are not, simply break down sooner or later and there is an end of it. Then the same desk seldom suits the height of two persons. A tall man will perhaps bend double over his work, and like his desk very much sloped and low. A shorter one will sit upright and want his desk high. It is needless to say which method is the more healthful. If complaint be made about the light, or the draught, or the arrangement generally, the reply will probably be that Mr. Stipple, your predecessor, did very well with things as they are, whilst a failing to see the necessity of alteration will be intimated. You are not told why Mr. Stipple did not stay and continue the use of the desk at which he did so well. At such atrocities have I been expected to work that now I take my own desk, and would advise those who study their own comfort to do likewise.

My desk is simple, inexpensive, and portable, and of the following description. A frame about fifteen inches square, of well seasoned wood one and a half inches wide and three-fourths inch thick, forms the stand. To this is hinged (with good hinges) the sloping piece on which the work is done. This is, of course, the same size as the frame, but solid, of half inch wood well clamped. Out of this a circular piece two inches in diameter is cut, either in the centre or nearer the top or bottom as may be preferred. To this is hinged a very light frame to form the top. Pieces of *iron rod* fitting in holes keeps the structure at a suitable angle.

The top frame is covered with black twill, which is continued down the sides. The whole of the inside is coated with black varnish. A couple of drawing pins will keep the negative in position, and if ground-glass is desired it can be fixed by the same means outside the circular hole. A piece of opal and a small mirror complete the outfit.

All ordinary work can be done at a desk like this, and it can be shut up and put away in a moment. The total cost should be about 8*s*., and even the most rural of village carpenters could make it.

STRIPPING FILMS.

By H. Manfield.

There are few things of more interest at the present time to the landscape photographer than the production of an efficient substitute for the glass plate of the negative, so I need not preface my remarks with any apology for writing on this subject.

Paper—oiled or otherwise—as a permanent support for gelatine emulsion has claimed a certain amount of attention, but I think it is generally admitted, even by its warmest admirers, that it cannot in all respects successfully compete with glass, therefore I pass it by, since my object is to direct attention to a substitute which will produce negatives in every way equal, and in some respects superior, to those on glass.

This substitute is the Stripping Film introduced in the States some time since by the Eastman Dry Plate and Film Company. It has not yet been placed on the English market, but will, I understand, be obtainable here shortly. Through the kindness of the Company I and others have been furnished with a supply of the films during the past season and have had ample opportunity of thoroughly testing them.

Here let me disclaim having any interest in the Eastman Company or desire to advertise their wares. I admit that my remarks might be open to such a construction, but as the stripping film offers especial advantages to the amateur and tourist over anything yet introduced, I think I am sufficiently justified in mentioning the only source from whence it can be at present obtained. To describe the stripping film briefly, it consists of a film of *insoluble* gelatine emulsion attached to a sheet of paper (which is a temporary support) by a thick layer of soluble gelatine. After the film has been exposed and developed in the same manner as a gelatine plate, it is 'squeegeed' face downwards on a glass plate coated with indiarubber solution, allowed to dry, and is then placed in hot water, when the paper is floated off, leaving the gelatine film firmly on the glass; a 'skin' of prepared gelatine is afterwards moistened and 'squeegeed' on to it, and when dry the whole is easily stripped from the plate, forming a perfect negative absolutely free from grain.

It will be seen that the manipulations are of a simple character, but there are a few details which require further explanation.

1. *Development.*—It is stated in the instructions issued with the films that soda, and not ammonia, must be used in their development, lest the action of the latter alkali with the pyro should render the gelatine substratum insoluble. If this were a fact it would be, in my opinion, a serious

drawback to the process, but I have used ammonia with perfect success, and can see no objection to it.*

2. *Indiarubber Solution.*—This must be made from pure rubber and pure benzole; if used too thick (four grains to the ounce is quite sufficient) the substratum is liable to break up in the subsequent treatment. The glass plates, which should be about three-quarters of an inch larger than the developed film and free from scratches, are best cleaned with tripoli and alcohol (only a slight polishing is required), and the rubber solution poured over them like collodion or varnish. I consider it best to let them remain a few hours to dry, as the substratum has a tendency to lift in the water if the plate is used immediately after coating. The developed negative (it is only necessary to rinse it under the tap for a few minutes after fixing) is now placed in a dish of water with the indiarubber coated plate, and the two are brought out clinging together and squeegeed in the regular way, of course putting a sheet of American cloth between the negative and the squeegee, and not using the latter too roughly. After this the film must be allowed to become perfectly dry. No heat should be used, but a warm room, at a temperature of about 70° or 80° Fahr. is an advantage. In my own practice I carry the films into the kitchen in the evening, and next morning they are ready for stripping.

3. *Stripping off the Paper Support.*—Immerse the plate in water (in a porcelain dish) at about 100° Fahr., and after five minutes' soaking pour *nearly boiling* water over it until the paper blisters all over and seems loose at the edge; *then* (and not before) detach it slightly at one corner with a needle, and *gently* pull it from off the negative film, which will remain attached firmly to the glass. This is a delicate operation, and requires care, for if the hot water has not thoroughly dissolved the gelatine substratum the paper will stick in places and have to be very lightly rubbed off with the finger after more applications of hot water, but it is best not to hurry the stripping, and to treat two or three films in succession. The film should now be rinsed with warm water to free it from all trace of the gelatine substratum and is ready for the final squeegeeing. Should intensification be necessary it can at this stage be treated with any well-restrained silver intensifier, and will intensify almost as easily as a collodion plate.

4. *Squeegeeing the 'Skin' to the Film.*—This skin, which is supplied with the films, is composed of gelatine to which is added glycerine to render it flexible, and should be cut in pieces slightly smaller than the film, as it expands considerably when wetted. It should be soaked in water containing a little glycerine (glycerine, 1 ounce; water, 20 to 25 ounces), for if placed in water alone the glycerine in the skin dialyses out, and the film becomes horny on drying. If, on the other hand, too much glycerine is used the film will take a long time to dry and be difficult to strip from

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* The following is the formula I use, given to me by Mr. Andrew Pringle, who works these films most successfully:—

A.

Sulpho-pyrogallol.

B.

Potassium bromide	120 grains.
Ammonia ·880	6 drachms.
Water	6 ,,

To develope take water, 1 ounce; A, 20 minims; B, 2 minims; commencing with half the quantity of B.

the glass. The solution is best used fresh for each lot of films or difficulties will occur in the drying. After the 'skin' is soaked until quite limp it is squeegeed on to the film, taking care to avoid air bubbles, and set to dry, the time occupied in drying depending very much on the warmth of the room and the state of the atmosphere. When perfectly dry it is cut through with a sharp knife, lifted at one corner, and stripped from the glass with one even and steady pull. Unless quite dry failure is certain, as the film cannot be got off the plate without stretching or tearing. Nothing now remains but to get rid of the indiarubber by gently rubbing it off with the finger. This breaks it into small shreds easily removed, and the negative is finished.

It may be argued that the process is a lengthy one (like this article, I fear), and that much time is taken up in the drying of the film. Granted, but on the other hand I would point out that the washing of the gelatine plate is dispensed with, and that if the various operations are carried out with anything like method, and several films treated at one time, the process is not so tedious as it appears on paper, and certainly entire absence of halation in landscape and interior work should count for something, to say nothing of the advantages offered by the roller slide over double backs, plates, and plate boxes.

A FIELD FOR EXPERIMENT.

By Alexander Mackie.

The favourite field for experiment with those who take up the scientific rather than the artistic side of photography, and that in an inquiring rather than a commercial spirit, has, in the past, undoubtedly been in processes for negative making; but now that dry plates can be purchased of such excellent quality, and at so reasonable a rate, only those who have at command conveniences and appliances such as most of us have not, can, with any prospect of success, hope to produce plates equal to those in the market, and the chance of being able to make better plates, except, perhaps, for some special purposes, is still more remote.

There is, however, in printing processes a field still open for experiment, in which the attainment of some degree of success is within the reach of any one possessed of intelligence and perseverance. It is true that we have many excellent processes now in daily use, but in each of these there is something that is undesirable. Albumenised prints fade. Carbon prints are permanent, but are difficult to manage even by the experienced. Collodion and gelatine emulsion papers, of doubtful permanency and, as with plates, more likely to be prepared successfully on a commercial than on a small scale. Platinotype, beautiful and permanent, but, unfortunately, entirely under the control of a commercial firm whose business policy appears to be to place all kinds of vexatious obstacles in the way of those who wish to work their process, and who apparently consider their duty to the photographic world to consist in extracting from it the largest amount of money for the least possible return.

It is to produce results resembling those by the last-mentioned process that I would suggest that attempts be made, not necessarily with a platinum base, for there are other metals which bid fair to be of good service in photography; at the same time there is no reason that platinum should not be the metal employed, for the platinotype patent, even if it could be sustained, which is open to some doubt, only covers one, or, at most, a few of the methods by which that metal can be reduced by the aid of light from its salts. By this remark, however, I do not wish it to be understood that I advocate taking advantage of any quibble that might be raised to deprive the Platinotype Company of what is undoubtedly their right, although they may not exercise that right in the most judicious or generous manner.

Much that is useful and interesting may be gleaned by reference to the numerous printing processes published about the year 1864, most of which were based on the discovery of Sir John Herschel—that some of the persalts are converted by the action of light into protosalts, which latter have the power of reducing some of the metals from certain of their salts, a power not possessed by the former. The persalts usually directed to be used were those of iron or uranium. As an example, I transcribe one of these processes, selected for this purpose simply because it requires the shortest description of any that I can find, in the hope that, though it may not be of much value in itself, it may rouse sufficient curiosity in some of the readers of the Almanac to lead to further investigation in the direction I have indicated.

M. L'Abbé Salvy's process:—

Take water	2 ounces.
Oxalate of iron*	53 grains.
Citrate of iron*	88 ,,

Make another solution:—

Water	2 ounces.
Nitrate of silver	53 grains.

Mix the two solutions. A precipitate falls, but the clear supernatant liquid is the sensitising solution. It may be applied to paper by brushing or floating, the excess then to be removed by blotting-paper, and the sensitised sheet exposed under a negative. When the proper depth is obtained the print is washed in several waters, and finally with a solution containing a few drops of ammonia. The print may be toned with gold.

◆

HINTS ON PRINTING PROCESSES.

By A. R. Dresser.

A few hints on the papers ready sensitised might be of some benefit, so I send my opinions on them.

Silver Paper.—On this subject I can say very little, as so many write on it who are far better able to give instructions than I am; but I think it is the best liked of them all, and by those who can work it properly by far the best results are got than by any other paper in the market. One thing about the bad keeping of silver prints is to be laid, I think, to not using enough gold for toning, and that if plenty of gold is used and the prints kept in hypo for from eighteen to twenty minutes and then well washed, the prints so treated would be nearly, if not quite, permanent. One thing I have learnt, and that is that prints when not pasted in a book or on a card last much longer, and hence the bad keeping qualities are due to the paste used or to the card or book they are put upon—which is in fault has to be learnt.

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* The ferric salts are probably intended to be used.

Platinotype.—This paper is by this time well known, and by the results to be seen in this year's Exhibition I should say was greatly used by the public, and certainly the results shown there are nearly perfection. The great fault in using this paper is that you cannot see what you are doing. You certainly see a slight impression, but when double printing in your sky you have to learn the exposure by practice or guess it. The great thing in its favour is the artistic results got and it being permanent, which for amateurs, who require to have prints of their work for own use, is a very great thing. But the keeping it from all damp, 'which if you do not do you cannot get a decent print,' and not being able to see how to double print, is greatly against it, as being a good price to buy you do not like to have half your prints spoilt by the paper being damp, or by having your clouds printed three times too deep. But I must say when you do succeed in getting dry paper, and properly developed, you have something very nice.

Bromide Paper.—This paper is for use for printing by artificial light, and is of great use to those who require a print in a hurry or who are unable to work by day. The only paper of this sort I am able to speak about is Eastman, as that is the only make I use. I find very good results are to be got, and if your negative is of the right kind, and you develope properly, the results cannot be told from platinotype. With platinotype you require a plucky negative, but for bromide you require a very thin one with plenty of detail, and often when you have what you consider a very thin and poor negative, that will not print well in either silver or platinotype, you can get very good results by trying bromide paper. For enlarging, this paper is nearly all that could be wished, and with care very good enlargements can be got, and nearly as good as the prints from the small negative. I think that in all cases with this paper you should give a long exposure and use a weak developer, that is to say, dilute as per rules with as much water as developer used, as by this you get soft and nice prints. I am sure that if those who are unable to print with papers that require daylight would only learn to work this paper they would be very pleased with the results they would get.

Alpha Paper.—This paper is for use the same way as bromide paper, and is usually exposed by artificial light, exposure and development the same way. You can develope with pyro and ammonia, or pyro and potash, or soda, but I do not advise one to do it, as the results are not as good as if you use the iron developer; and, besides, when pyro is used, the prints have a dull, sickly look, as though they were fogged. Any amount of latitude is given in this paper as far as exposure is concerned, as I have given the negative and using the same developer (said developer same strength for all prints) from fifteen seconds, 'one foot from a gas burner,' up to six minutes, as the results were not very different. The negative used was a rather thin one, and was vignetted through tissue-paper. The developer used was saturated solution oxalate potash, three ounces; saturated solution iron, half ounce; bromide (one drachm to one ounce water), six drops; and after mixed, one ounce water added. The fifteen seconds exposed one was the best, and was just like a good bromide print, and nice and soft. The next was thirty seconds, which was nearly as good. Next, one minute; the detail was not as good as before, and the print a brownish colour. The rest taken were two, three, four, and five minutes exposure. I found the longer you exposed the more you lost detail and the redder the tone; but still, when giving up to five minutes, you did not quite lose detail, but the print when once started came up so quick you had no chance to watch it, and one very funny thing was that the five minutes exposed one came up (at first) no quicker than the fifteen seconds one, but when it did start it made up for lost time. I did not tone any of these prints, but they can be toned by using the ordinary toning bath, either before going into the hypo or *after*, and can also be toned by using gold alone without any soda with the gold. I find, as I mentioned, that you can tone, after coming out of the hypo, by washing for a few minutes and then putting in a bath (of gold, one grain to every ten ounces water), and watching till tone required is got; but by so doing the only colour I have got was a deep black or grey, very like platinotype. It does also for enlarging quite as well as the bromide papers, and has one thing in its favour, and that is that you can get different colours from a deep grey to a brown or red, which some would like. I feel sure this paper has not had a fair trial, and that if pushed there is a good opening for it, as the results I get are very good, both by contact printing and by enlarging, and I feel sure that if a trial is given to it results can be got as good as bromide papers, and one thing in its favour is that the price is nearly half less.

I have now made my paper quite long enough, and must conclude by saying I hope that some one may get a hint from my attempt at explaining. As for saying which is really the best one to use, I should be sorry to set myself up as a judge, as every process has its own points and friends, only *one* more so, but 'Which one?'

THE PRINTING PROCESS OF THE FUTURE.

By Herbert S. Starnes.

The subject which will be uppermost in photographic experimental work during the coming year will probably be that of the printing processes. Gelatino-bromide dry-plate making has so developed into that of a trade, that probably any discovery made in connexion therewith will be sold to the plate makers and be worked as a secret process in future, and those who make their own plates have settled down to a formula which they can work satisfactorily, so that experimental work will probably take other directions. Indeed, it is quite time that many questions in connexion with our printing processes on paper be thoroughly overhauled. The first and most important of all is that of permanence; and I think if one of our Photographic Societies would appoint a Committee, as was done about thirty years ago by the parent Society, to thoroughly go into the question of the permanence of the various processes and discover what points in connexion with each process where extra care is necessary to make our pictures permanent.

The subject of the paper and its preparation is also one of the greatest importance, and at present photographers, both professional and amateur, are entirely at the mercy of the paper makers and others. What photographer knows anything of how his albumenised paper has been prepared, or whether there is anything in it likely to affect the permanence of the image to be produced upon it? The only questions to him appear to be the brilliancy of the result when first prepared, the required strength of the bath, and the price. If in a few years the prints fade the blame is at once put down to the process. But when we see albumenised prints printed twenty-three years ago as bright as if they were done yesterday, the fault must be either due to the method of working or to the preparation of the paper or albumenised surface. It is a grave question in these days of cheapness and trade competition whether these points are sufficiently taken into consideration by those who supply the market with albumenised paper.

Next after the question of permanency is that of range of tone and delicacy of image, from the darkest shades to the highest lights. Here there is no doubt that albumenised paper holds first place, especially for small work. With a suitable negative platinotype or the modern bromide emulsion printing papers no doubt run it very close, but, as a rule, there is a flatness in the darkest shadows which we do not get on albumenised paper, and there is also a less graduated range of tones from light to dark.

The next questions are the colour of the image and that of a glazed or dull surface. These are mainly questions of individual taste, so it is needless for me to go into them. My own idea is that for work over the size of half-plate the dull engraving colour of the platinotype and the developed bromide paper processes lately introduced are preferable, but that for small work the delicacy and brilliancy of an albumenised print is unequalled at present.

The last question is ease of working, and here the wants of the amateur and professional are slightly different. By the former I mean one who is engaged at other business during the day, and finds the printing the principal difficulty about his photographic work. For him the bromide printing process requiring development is just the thing, as he can work by artificial light. I feel convinced for an amateur who, as a rule, only requires a memento of places he visits, that the best thing for him to do to get the greatest amount of pleasure with the least fatigue, &c., is to take quarter-plate negatives and enlarge from them up to the size he requires on the bromide paper, because he seldom requires more than one or two prints from each negative.

What the professional requires in the first place is certainty of results, and I am doubtful if ordinary assistants could be depended upon to give him that with a development process. It seems to me that it is more difficult to get a perfect developed print than it is a negative, because in the former detail in the shadows is lost so rapidly.

For certainty of result there is no doubt that nothing will equal a printing-out process, and I cannot help thinking that *the* printing process of the future will partake of this nature, and that an albumenised print will not be a thing of the past until we can do away with invisible, or partly visible, images requiring development. Besides, it is very doubtful if in a business turning out several hundred prints a day (say from 100 negatives), a man would not get on as fast with a printing-out process as he would if he had to develope each print. Of course, if he required fifty or a hundred prints from each negative the case would be different, because then he could use one of the repeating frames.

Then we have double printing, printing in clouds, and the numberless dodges one can do with a printing-out process, which are nearly impossible by other processes. But I think I have said enough to show that the printing process of the future must be something different to what has been introduced yet, and that photographers are sensible in not throwing over albumenised paper until they are shown something which can take its place by giving equal results with equal certainty.

NON-EXPOSED DRY PLATES.

By Thomas Gulliver.

I have, as part of my business, lately had much to do with amateurs in the way of developing and printing from dry plates, and often meet with plates that have been exposed twice over, and a corresponding number of plates that have had no exposure at all. These last I have made available for future use by well washing them, back and front, then draining for a short time and drying in a dark box. When dry, which is generally the next day, they may be returned to the dark slides and used, and will, perhaps, be just as good, only requiring a little longer exposure.

Sometimes I have a bright, silver-like surface stain on and near the edges of the plates, but in no case has it interfered with the printing qualities of the negatives. I have kept some four months between the washing and exposure. There seems to be a limit to their keeping qualities, but in the time named above they are nearly equal to new plates.

ON TOUR.

By Rev. J. Carter Browne, D.D.

Looking on the Almanac of The British Journal of Photography as a *pot pourri* in which the difficulties of its readers are stated and resolved, as well as a most valuable compilation of the various *gradus ad Parnassum* that have been taken during the year by the more eminent photographers, I propose to put before its readers a difficulty with which I was lately opposed, and the manner in which I dealt with it.

During my summer tours—I took two this year, but owing to the unpropitious state of the weather during the former of them I did not unlimber—I took up my headquarters at Llanwrtyd Wells in Brecknockshire. By the way, if any of our brethren are devotees of the rod as well as of the camera, I know of few places where they may combine the two entrancing arts as they can here. When there is too much wind for photography—and nothing looks so bad in a picture as a blurred foliage—the fishing is excellent, and when the leafage is still, the wary eye and skilfully-selected spots, of which their number is legion, will bring joy to many a household in pictorial reminiscences. At Llanwrtyd, as elsewhere, I found the resident owner of the studio a kind-hearted man, willing to assist the amateur to the utmost of his power. I was by no means averse to accepting the offer of the use of his dark room; but being used to one where I have plenty of elbow-room, I found an area of nine square feet somewhat too circumscribed for changing three double dark slides with 10 × 8 plates; consequently I had to make shift as well as I could in my lodgings. Locking the door, when all was still for the night, I arranged dark slides, camel-hair brush, and plate boxes all before me, and putting out the gas, set to work. (And here let me say that I always transfer my plates, with the exception of one maker's, from their paste-board enclosures to grooved metal boxes, as being more convenient in many respects.) No sooner had I the plate box open one night and all going on comfortably, than a light suddenly appeared at the opposite window, shining directly through the Venetian blinds in a part that required repairs, on to my extra rapids. The resulting fog was certainly scarcely perceptible, but I at once resolved not to run such a risk again. Coming home I constructed a box, of internal dimensions two feet one inch long, one foot one inch broad, and one foot one inch high. The box opens at the side, which lets down on hinges; over this open space I have a hood composed of two thicknesses of canary medium, the lower mouth of which lies under the let-down side and surrounds the opening of the box, and has holes to insert the head and arms, all gathered up in folds with elastic webbing. I have a sash handle to carry the box by—which I never leave to the tender mercies of porters—and beneath this handle a window of ruby glass covered with a hinged shutter, and thus at any time, by day or by night, I have at once a most convenient changing box, which also serves to carry everything required on tour, saving only the camera legs.

NON-ACTINIC MEDIA.

By James Alexander Forrest.

There has no subject been more written upon than non-actinic media. My only apology for directing attention to it once more is that I think I can throw a little more light into the matter from being brought up a glass maker. Technically, there are two modes of making 'coloured glass'—one 'flashed' and the other 'pot metal.' Flashed glass is made by dipping the end of the blowpipe twice into the pot of molten glass and once into the pot of molten coloured glass; when blown out into a cylinder and afterwards flattened into a sheet, it has two thicknesses of white glass and one of coloured. Ruby can only be made in this way because of its density, hence the difficulty of producing uniformity of colour is very great, especially when the size required exceeds 30 × 20. Long experience in the use of this glass proves to me that it has an injurious effect upon our eyesight.

Turning from the consideration of this colour and all colours produced by 'flashing,' which have been explained and the reasons given, we would now enter upon 'pot metals,' *i.e.*, mixing the colour ingredient along with the sand and the alkali in the process of melting. In this way all colours are made, except ruby, from tints to positive colours. Those manufactured under the name of Cathedrals have an abraded surface, by a roller pressing over it in the process of making, to give it the softened effect of antique glass. The colour is homogeneous in all 'pot metals.'

The high state of sensitiveness now reached by the manufacturers of gelatino-bromide plates prevents any colour so produced by itself being non-actinic. The following experiments have been made by a friend: I can vouch for their accuracy, having carefully examined the films exposed.

Experiments with small petroleum lamp placed eight inches behind the coloured media. The sensitive plate placed for five minutes one inch from the glass, and five minutes in developing:—

Description.	Light.
A.—Cathedral green glass and pot orange glass combined	Good and translucent.
B.—Cathedral green glass and a single sheet of Forrest's yellow paper	Fair, but not as penetrative as E.
C.—Cathedral green glass and a double sheet of Forrest's yellow paper	Too weak to work by, no penetrative power.
D.—Pot orange glass and a single sheet of Forrest's yellow paper	Very good.
E.—Pot orange glass and a double sheet of Forrest's yellow paper	Very fair, better than B.
F.—Two sheets of Forrest's yellow paper on plain glass.	About the same as B.

E. was put to the test, seeing it was the best, even withstanding *three* times the exposure without injury.

Two years ago I paid a photographic visit to Scotland, taking a Browning spectroscope with me, and called at various photographic establishments to develope, and in only one case did I find the media of the dark rooms non-actinic. The partial freedom from foggy pictures is due to the rapid mode they flush the plate with pyro and ammonia and the protection it produces by the red colour of the developer. I recommend my photographic *confrères* to purchase a pocket spectroscope, and make themselves safe.

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ANOTHER DEVELOPER.

By A. E. Bannister.

Old, as usual! Very likely. However, as all may not have seen our old friends mixed up in this way before, here goes.

A.

Sodic sulphite	8 scruples.
Water	20 ounces.

B.

Pyro (dry)	2 grains.
Water	1 ounce.

C.

Ammonia (liq.)	1 ounce.
Bromide ammonium	½ ,,
Water	½ ,,

1 ounce A; 1 ounce B; about 4 drops C for half-plate landscape, or 7

or 8 drops C for portrait. Advantages: sulphite (solution) keeps well; pyro (dry) ditto. Sulphite gives density by slowing development, as well as preserving plate from stain, and, more or less, can be used as required. Have given it some months' fair trial and am well satisfied with it.

◆

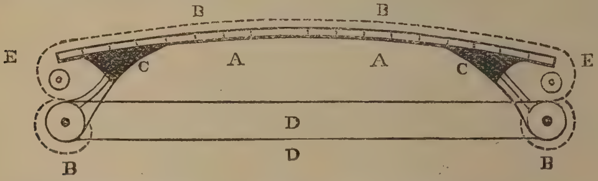
WHAITE'S PANORAMIC BACKGROUND FRAME.

By T. G. Whaite.

I have devised a convenient method of hanging and storing backgrounds, by which the operator is enabled to produce eight or ten changes out of half the number of backgrounds. The old Panoramic Exhibition rollers have often been tried, but have been found unsuitable on account of the bagging in the centre and the impossibility of keeping them tightly expanded. I adopt these rollers, but in addition allow the cloth to travel over a *very slightly convex* backboard, formed of a number of strips of wood, which, giving the cloth a 'bite,' prevents creases and bagging; the cloth, as it winds and unwinds over the two small rollers, is pressed with a novel kind of brake. These are made the entire height of roller, are placed at the back of the frame, and are in the form of long, sparely studded brushes of the brown reeds used in common sweeping brooms; as these press only on the back of the canvas the painting is never injured.

As the canvas travels from one side of the room to the other it is obvious that a great number of changes may be made by using different portions of the backgrounds, especially where these are graduated the dark or light parts can be so advanced to the figure as required. The present form of canvases are best *glued* to form the panorama.

Subjoined is a section (laid flat on floor) showing convex boarding, rollers, brush brakes, background, and one strap. The rackwork for winding is not shown, being in the centre.



A A. Convex boarding. B B B B. Dotted line shows background.
C C. Brush brake. D D. One of two straps.
E E. Small rollers to lead over backboard.

◆

QUICK LENSES AND ORDINARY PLATES, OR *VICE VERSA*.

By Thomas Gulliver.

A friend and I have gone through a long series of experiments to determine which is most advantageous to use by a professional photographer, quick plates and the usual lenses, or quick-acting lenses and ordinary plates, and in all cases the balance of advantages seems to be in favour of quick-acting lenses and the ordinary plates. Thus the lens is only one first expense, the quick plates are a constant increased expense. The quick plates very often give very thin, poor negatives, and always require great care in developing; the ordinary plates are in general use, the development is more under control, and in general give better printing negatives. A little more care is certainly required in posing and general arrangement; but, all things considered, we came to the conclusion that quick-acting lenses and ordinary plates offer best value to a professional photographer.

In the above I allude to portrait business, not yet having given landscape work a trial.

◆

STRAY THOUGHTS.

By Friese Greene.

I have been struck sometimes on observing the indignation displayed by some photographers on a customer wishing to resit for what is to them an unsatisfactory photograph. In the present stage of competition I hold that every photographer should treat each and every customer, no matter how small their order may be, with infinitely as much eagerness to please and courteousness as he treats the customer who is satisfied with his picture and gives a good order—the beneficial effects of which will be seen by the constantly increasing recommendations he will receive from those he has humoured. Competition is rendered more and more necessary as the years roll on. Compare the prices of dry plates now with that of five years ago. Although thought too expensive for everyday use by many, no one could have anticipated the present low prices, and yet with all the fall in price no one can deny that we are using a better article now than was made then. In our own profession I do not think there is sufficient knowledge diffused among all its members, The British Journal of Photography and *The Photographic News* being at such a price that not all who would can buy them and so keep themselves informed of all that passes; not that they are too dear, but at a lower price, perhaps, double the number would be sold, and the knowledge scattered abroad would be trebled or quadrupled.

I wrote two years ago on *Examinations*, and was pleased to see the correspondence it caused, but at the same time saw, and still see, that the scheme I mooted still awaits somebody with good organising powers, and, above all, the power and authority to act. The Technical Guilds Examinations and the classes at the Birkbeck and Polytechnic Institutions go *one* step towards the goal, but *only one*. The various fields of invention that still lie open in photography are such that only the trained student can battle in—trained not alone in theory but in practice. I do not for my part see why we should not print direct on to the prepared card mount, so that the picture forms part of the substance of the card—it would at least simplify some of the processes, and, as in all other branches of science, a great field lies open to photographic invention if directed in the paths of good taste and simplicity. From the 'Answers to Correspondents' column of one of the weeklies lately, it seems that one inquirer, with 30*l.* to 40*l.*, thought of taking say half a dozen lessons and then launching himself into the ranks of professional photographers. This will show how superficial is the knowledge of some who seek to join us, and who for their own sakes, we may suppose, hope to find success await them, forgetting that he with little capital really wants more training and experience than the man whose capital supplies the lack of brains, and perhaps really not knowing that others who had gone before them, as in the case of Rejlander and Woodbury, have not lived to see their great successes and themselves famous as they are now—the one by his studies in the direction of art and the other by overcoming the difficulties attending the preparation of a transparent support for the gelatine film. As for myself, the more I learn of photography and its laws, the more I feel my ignorance.

Any ambitious man who wishes to carry a point had better carry wool in his ears until his end is gained. What I wish to see is more realism in *all* branches of photography, not so much of the artificiality which almost every photographic portrait bears on the face of it. I almost laugh—even when looking at some of my own work—to think that these pictures with a painted representation of it, may be 'Taras' Walls,' the 'Houses of Parliament,' or an 'Oasis in the Desert,' should be supposed or expected to appear anything like what the real scene would be. I have even seen in a photograph a country joskin standing by the eternal stile with a representation of the Great Pyramid behind him. I dare say every photographer has his own ideas of what he considers combines the tasteful with the picturesque effect; then, if he has the real articles, I hold that he will produce, with careful arrangement and posing, more artistic effects than any efforts of the composition or *genre* photographer. Of course circumstances alter cases, and tastes change so much and differ so greatly that the best efforts and original ideas of no man should be despised. It is only by these means that the condemnation of photography by Ruskin and others (for whom I have every respect) can be rendered unjust and undeserved. Good taste and originality, these are the attributes which displayed in work betray the *man* who is the author of them. Then I should like to see the prize pictures of each year, together with the gems of the exhibitions, reproduced or printed in some permanent process, and collected together on the walls of a permanent gallery for the special purpose of exhibiting these photographs and illustrating the art—its rise, growth, and triumph.

In the future of photography I believe magnetism and electricity will play an important part; and although I do not care to anticipate, I have seen so many wonders and marvels that I feel it impossible to do less than look forward with great hope.

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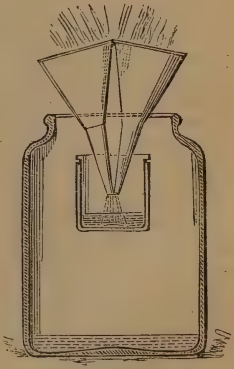
AVOIDABLE DANGERS.

By A. L. HENDERSON.

It is a common belief (and I have shared in it) that an emulsion composed of a variety of sized granules would give greater harmony of gradation than one of uniform size; later experiments made in camera (not a joke) have disproved this. I have come to the conclusion that to get the best results uniformity in the precipitated bromide of silver is necessary. But the question will arise, How are we to obtain this? Certainly *not* by adding the silver to the gelatino-bromide slowly. By this method, a constant change is taking place as the silver is added to the gelatino-bromide solution, the solutions are getting attenuated, and the last portions coming together the silver bromide is usually coarser; true, it may be argued that by the liberation of the nitrates the restraining action of the latter will compensate. If a large amount of gelatine is used the difference will not be so noticeable, but it is not advisable to increase the amount of gelatine. There are only two methods I know of to remedy the evil: first is (to use an expression of a plate maker) flop it in, *i.e.*, mix the silver and bromide as rapidly as you can, then shake the solutions violently; the other method, I think, is perhaps better, viz., have the solutions running together through two funnels into a small jar placed close to the outlet of the two funnels; the small jar must be so arranged that it shall overflow into a large jar of the capacity of the whole batch of emulsion, as shown in the cut. I am quite sure that a much more harmonious negative will result from an emulsion made in this way.



One more 'avoidable danger.' Suppose we have an emulsion giving twenty-four on the sensitometer, and we mix some which is much slower, say fifteen, together, so that we get a mean speed, say twenty, we have a mechanical mixture of an emulsion one-eight times faster than the other; how can we expect true gradation in this case? Take the case of a wet collodion negative, we have a gradual building up of the image from the highest lights to the deepest shadows with true graduation; not so with a gelatine plate composed of various sized molecules, hence the feeble want of pluck or vigour noticeable in the shadows.

I could write till Doomsday on this subject. I venture to think your readers will want other hints when they are on the verge of this transitory state. One question more and I will have contributed my mite to the ALMANAC: What would the result be of incoating plates in a light that would affect a plate giving twenty-four on the sensitometer mixed with one giving fifteen? I think they would be in the same predicament as the writer.

◆

ENLARGEMENTS FROM SMALL NEGATIVES: FURTHER EXPERIENCE.

By G. A. KENYON, M.B.

SINCE the publication of the ALMANAC for 1886 a new gelatino-bromide paper has come into use, namely, the Eastman Permanent Paper. The results obtained with this paper far surpass anything previously experienced, but the exposure required is considerably longer than that with Hutinet paper. Consequently, I have modified my apparatus somewhat.

Instead of stopping down the lens supplied with the lantern necessary to secure sharpness with the form of lens sent out even with lanterns intended for enlarging, I have substituted an extra rapid rectilinear lens with the happiest results, sharpness equally distributed, with great ease in focussing, owing both to more light transmitted and more apparent depth of focus, and this with full aperture.

At the same time, to obviate the tendency to smoke common to three-wick lantern lamps, and to further improve the sharpness of the image, I have substituted an Argand paraffine lamp for the three-wick lamp. This can be left any length of time without attention, and as an exposure of three-quarters of an hour is sometimes necessary, this is no small convenience.

In spring and summer, when there is plenty of light and no long, dark evenings, daylight enlarging is very quick and simple, and the exposure is often measured by seconds rather than minutes, whilst the definition with the rapid rectilinear lens is perfect even with full aperture, the focus of the said rapid rectilinear lens being about two and a half times the diameter of the plate, and the lens pointed towards the sky.

In order to secure fine definition in the original negative, I have adapted my four-inch Ross' portable symmetrical lens to one of Shew's eclipse hand apparatus cameras, so that the focus is rigidly fixed, and I find this a great convenience, but I use the camera with a support or stand, of course. I have a brass tube adapter by means of which I can use a five-inch lens, or with the four-inch can approach very close to any minute object I wish to copy, as, for instance, ice scratches on a rock.

There is no rising front to this camera, but I get a corresponding effect by varying the position of the dark slide, the camera being quarter-plate, and the dark slide constructed for plates three and a quarter inches square, two little pieces of wood, which are movable, enabling the adaptation. I have ordered a quarter-plate roller slide for use with films or transparent tissue, or even Eastman negative paper, which, though hardly transparent enough for distant objects, can be made so by removing the paper by friction, having previously cemented the negative to glass with the aid of gelatine and alum.

For ordinary purposes, the *modus operandi* is with the lantern as follows—to enlarge a three and a quarter inch negative to 12 × 10:—

A lantern is taken with a six-inch condenser, the negative is placed in a carrier close to the condenser; an eight-inch or thereabout extra rapid rectilinear is the objective. The paper is placed in a printing frame which stands on the window-sill, the lantern stands on a table the same height as the window-sill, and the table is drawn away from the window until the focus is approximately reached. The focus is finally adjusted with the rack fitted on the lens (I have placed my rapid rectilinear lens inside the brasswork of the original lantern lens—it just fits into the stop), the Argand lamp, the diameter of whose burner is only three-fourths of an inch, having been previously placed in its best position. Focussing is of course done on plain paper, for which the sensitive paper is afterwards substituted. A piece of wood nailed to the front of the window-sill ensures the printing frame being replaced in exactly the same plane. The printing frame is a massive one with plate glass, which stands firmly either on its side or end.

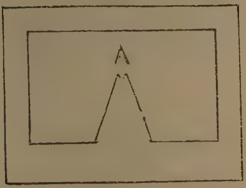
As the three-and-a-quarter-inch negative is so much smaller than the six-inch condenser, the exact adjustment of the portion of negative required is obtained by moving the carrier up or down or sideways in front of the condenser. The whole operation is perfectly simple, and the results superb.

If I want a very large magnification of a small part of the negative, I find the shorter focus Sciopticon arrangement more convenient, using a rapid rectilinear lens of about four-and-a-half-inch focus for the objective.

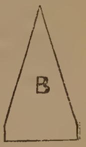
The Argand lamp burner costs a few pence, but I have had to get a flat tin receptacle made to fit under it for the oil, as the lamps ordinarily sold are too high for my lantern. The light yielded when properly trimmed and truly centred is very brilliant and most effective.

TWO INCIDENTS.

By H. Norwood Atkins.



No. 1.—Having an invitation to spend a few hours on a steam yacht in the Mersey with a small cargo of amateur photographers, I eagerly accepted it, and made the following preparations :—I marked on the baseboard of my camera a line which indicated the extension of the camera to a point giving an average of definition on the focussing screen for every object beyond about forty feet distant. I then took a piece of ferrotype plate about 4 × 3, and cut out of it an aperture of the shape shown in the figure, the notch at A being the centre of the picture and the area of the opening *proportioned* to the size of my plates. I fastened a thin strip of wood to the back of the camera and slipped the above view meter into it at the top. I fastened a similar slip of wood to the front of the camera, and between the wood of the camera and the newly added slip I placed a second piece of ferrotype plate shaped thus :—



I then arranged the two pieces of ferrotype in relation to one another in such a manner that when the point of B on the front of the camera appeared in the notch in A the object covered was in the centre of the focussing glass at the same moment.

Thus prepared with a half-plate camera, Edwards's plates, Steinheil's lens, and Kershaw's shutter, I went on board at the hour appointed, laid my ground-glass on the top of the cabin, and prepared to get my camera extended and ready. While I was preparing a genial friend came up, greeted me heartily, and sat down on the focussing glass. The speed with which he arose and the apologies which he uttered are of no consequence here. The point is that my previous preparations made me calmly indifferent to his choice of a seat, and extending my camera, adjusting the sights, and gathering the three legs of the tripod into a point with an elastic band to keep them thus, I spotted one object after another, and out of thirteen exposures on moving objects—steamers, yachts, &c.—we ourselves going at full speed all the time, and in spite of a stiff breeze and the vibration of the engines, I had the pleasure of developing eleven gratifying negatives.

No. 2.—Having taken by magnesium light the portrait of a friend, and wishing to do the same at a public meeting, and at once turn the portrait of the chairman into a lantern slide, I accomplished my object as follows. I developed and fixed the negative, washed it hurriedly under the tap, then blotted off the water and placed the negative in the printing frame. I put in each corner a small piece of blotting-paper, and laying a sensitive plate on the pieces of blotting-paper, which just prevented contact, I put on the back of the printing frame, and holding it firmly against the wall turned up the gas for the proper time, and then developed and fixed the transparency. The result was as sharp as if the negative had been dry and the plates in contact. The transparency was soaked (after fixation and hurried washing) in methylated spirit, and in a few minutes was in the lantern and received great approval.

The lanternist produced a sensation by first displaying the negative on the screen and then dissolving it into the positive.

On one occasion the positive cannot have been soaked in spirit, and while the audience were admiring the portrait on the screen the stomach began to heave convulsively under the waistcoat, the ears began to slide up the side of the head, and a general transformation of the most horrible and ludicrous character took place. The audience took it for an arranged thing, and cheered enormously. It was a most melting scene, and, as my readers will readily guess, was due to the effect of the heat in the lantern on the gelatine.

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A NEW METHOD OF RENDERING PAPER NEGATIVES TRANSLUCENT.

By P. Swanson.

Thoroughly clean a piece of plate glass (somewhat larger than your paper negative), polish it with powdered talc; remove the talc with a damp cloth all round the edges of the plate for about an eighth part of an inch. Next coat the plate with enamel collodion. When the collodion is set, wash under the tap till all signs of greasiness disappear. Now take your paper negative, which must have soaking in clean water for some time, and squeegee it on to the collodionised plate. Stand your plate up to dry. It is most important that the paper negative be *thoroughly desiccated* before proceeding to the next operation.

Procure a bottle of 'Craig's Medium for Bronze Painting,'* and thin it down to the desired consistency with turpentine or benzole. (I have found this a far more elegant preparation than gold size; it becomes hard in a very short time, and is quite colourless.) Now take your plate with the *dry* negative and flow it over with the thinned 'medium.' Repeat the operation rapidly till the paper is rendered translucent. Set aside to dry once more, and when the solvents of the 'medium' have evaporated and the surface feels hard again coat the negative with enamel collodion. You have now got your translucent negative between two films of collodion. When the last coat of collodion has become perfectly dry run a knife round the edges of the glass and the negative will peel off. Try it.

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* Manufactured by W. T. Craig, Wick, N.B.

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PHOTO-MICROGRAPHY.

By Procella.

So much has already been written on this subject that it may well be thought impossible to say anything new about it. After the excellent paper by Dr. Maddox in last year's Almanac it will, no doubt, savour of presumption in any one to make further suggestions. Yet, as there is wisdom in a multitude of counsellors, it may be proper to view the matter by the light of an *alter ejusdem*. Photo-micrographic cameras are of two sorts:—1. Those which consist of a long wooden box, to the front of which is attached a microscopic arrangement for holding the object glass and stage; 2. Those in which an ordinary microscope is used along with an extending camera. Both of these have certain imperfections in detail, which it may be well to point out.

As regards the first kind, where the camera consists of a long wooden box, either tapering or square, it has several faults. The length is uniform, consequently with any one object glass no variation of the magnification can be obtained unless by the use of different eye-pieces. As usually made, apparatus of this kind is intended to be used without an eye-piece, although that made by the Bausch & Lomb Co. is used along with an eye-piece. When so used the whole apparatus is so short that the adjustment of objects on the stage comes within easy range of the operator's hands, and is, therefore, readily attained. In the Bausch & Lomb Co.'s apparatus the stage is mounted on a separate sliding block of wood, which serves for the coarse adjustment, while the fine adjustment is obtained by an ordinary lever, the end of which is acted on by a rod projecting beneath the focussing screen. Dr. Zeiss' (of Jena) smaller apparatus is very much the same, only he uses an ordinary microscope stand in front of the box. It will readily be granted that a good microscope stand must be the best arrangement, and that anything whereby its use may conveniently be facilitated will be of value. Good photomicrographs are got I know by the use of eye-pieces, but it is better to dispense with their use wherever that can be done. I mention the above two makers' names, as their productions are very good types of this kind of apparatus.

The second sort of apparatus, in which a good microscope is used along with a lengthening camera, therefore, is no doubt the better arrangement. With it any magnification may be got, either by the use of eye-pieces or without them. When the apparatus is a long one considerable difficulty has always been experienced in arranging and lighting the object. This difficulty is not felt but to a very limited extent when the lower powers of the microscope only are used—those, say, from the two-inch to the half-inch object glasses; but when these are exceeded it becomes a matter of great difficulty to arrange an object on the stage of the microscope and light it in such a way as we should like to see it when we examine it by the microscope alone. Microscopic objects should invariably be photographed under the same conditions as regards illumination as when we thus examine them, if the same effects are desired in the photograph. Dr. Maddox attempts to overcome this by mounting the microscope upon a circular disc of wood attached to the long baseboard of his apparatus, upon rotating which he is able to turn the instrument to the side when withdrawn from the camera, place the microscope upright, and select and arrange the object; then he turns the microscope round in a line with the camera, and inclines the tube until it is horizontal. This is a very convenient arrangement for finding the object, but it has this disadvantage, that the principal part of the process—regulating the illumination—has to be arranged over again. This difficulty is simply and easily overcome by a plan which I have adopted. It is this: I mount the microscope, condenser, and lamp, on a separate mahogany board about a foot long, seven inches broad, and one inch thick, which I can lift off the long board on which the camera is fixed. I place this board on a separate table, incline the microscope to the horizontal position, the position it is intended to occupy when photographing the object, and when so inclined I find the object, arrange the lamp and the illumination in the way I want it to be—often a matter of no small difficulty with high powers—then remove the board with the microscope, condenser, and lamp, so arranged, and place it on the long baseboard in front of the camera, sliding it along between two fixed strips of wood. When the connexion between the microscope and camera is thus made, the only thing left to do is to adjust the camera to the length necessary for the magnification I wish, then focus sharply and expose. Any one will see that in this way the chief difficulty—the illumination under high powers—is perfectly under command. We are simply examining an object in the ordinary way, arranging it by the best method we know to bring out its peculiarities, and then place the whole thing so arranged and undisturbed in front of the sensitive plate. To arrange an object under the microscope alone with a high power, so as to show it well, is very often a matter requiring the highest skill of the best manipulator; but how much more difficult this must be when it is attempted to be done while the microscope is in connexion with a camera can scarcely be conceived. The way I have indicated above gets rid of all these difficulties, and what the sensitive plate receives is exactly what the human eye perceives, and under the same conditions. To those whose apparatus does not admit of this arrangement, one of the chief difficulties with all powers is to get the light exactly in the centre of the object glass. This is best attained by removing the focussing screen and looking through the optical portion from behind. If the light is central it will be seen as a reduced image in the centre of the object glass; if not, it must be adjusted until it becomes so. No amount of trouble must be spared in attaining this end, otherwise the resulting negative will be dense at the one side and thin at the other. Another matter to which particular attention should be given is the correct register of the screen and slide. When we consider that by the enormous magnification of the object in a microscope and long camera, sometimes amounting to many hundred diameters, a touch of the fine adjustment screw which will only displace the focus by, perhaps, the $\frac{1}{5000}$th of an inch is distinctly perceptible, we may see that if even that amount of variation occurs in the register the resulting photograph will be out of focus. There cannot be a doubt that an arrangement such as Professor Piazzi Smyth had in his small camera at the Pyramids would be the best. Let the screen rest against three ivory or silver points, and when the focus is obtained substitute the plate. One could then be certain of getting exactly what one had arranged to get, of which we cannot be certain now with the screens and slides in use, however nicely they may be made.

There is just one other thing I would like to mention. I see Nachet & Sons, of Paris, have made an arrangement for adjusting the light and object of rather a new character. They have placed a microscope tube at right angles to the normal one, into which the light is reflected from behind the object glass by means of a right-angled prism, so that when the microscope is horizontal the additional tube stands upright. This additional upright tube may be drawn up out of the way after the object has been satisfactorily arranged by its means before the photograph is taken. It will serve the purpose very well, but is quite unnecessary in view of the suggestion I have made above.

There are many other matters of detail about which I might spin out this short paper, but I fear it is too long already. I conclude, therefore, by expressing a hope that my suggestion may be found as useful to others as it has been to me. We cannot have too much said on this subject, one of the most fascinating in the wide range of photography.

HOW TO CLEAN PHOTOGRAPHS AND OTHER PRINTS.

By Hermann Schnauss.

Suppose you have in your portfolio prints of really good negatives and you are proud to show them to your friends. These friends, however, are sometimes rather injudicious; they touch the prints with greasy fingers, or, what is worse, they do not think of the pen they have put behind the ear, and in looking at the picture there falls down on it a blot of ink. Perhaps you *say*, smirking, 'Does not matter,' but 'Go to the devil! My poor print!' you *think*. And now, how to remove the ink blot or the spots of grease. I will tell it you.

Do you wish to clean the print of spots of grease? Prepare a paste as follows: Take calcined magnesia, plain collodion, and pyro-acetic spirit. It is not necessary to weigh the quantities of these ingredients exactly, it is sufficient that the paste shows the consistence of a somewhat soft salve. You may take about equivalent quantities. Having mixed the paste by rubbing, put it at once with a paper folder on the spot. Here it remains until the volatile substances are thoroughly evaporated. The remaining powder is wiped off with a quill pen. Apply the paste again until the spot has totally disappeared. Do not use benzole for this purpose.

To remove an ink blot, put on a concentrated solution of chloride of lime or fresh prepared *eau de Javelle*. This will bleach the spot at once, but you must take care that the solution, after the spot has disappeared, is removed as quickly as possible with some blotting-paper, and by following rinsing with distilled water or rain water. Even spots of an older date may be removed by this solution quickly and surely.

Or you have a photogravure or a copper-printing, which by prolonged lying have turned yellowish and fusty. Stick the print with drawing-pins on a board, clean it with a soft brush carefully with a solution of carbonate of ammonia, one and a half ounces in thirty-four ounces of water, then rinse the print with water, and repeat the process on the back of the print as soon as it has dried. Now wet it with water being acidulated with wine-vinegar, and wash with water to which some chloride of lime has been added. Lastly, rinse once more and dry in the sun. The print will turn perfectly white without the picture being damaged.

There is nothing new about these processes, being collected from German journals some time ago, but they have been proved and all found to answer admirably.

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A GOOD DEVELOPER FOR GELATINO-BROMIDE DRY PLATES.

By Clement J. Leaper.

The following has been in constant use by the writer for the last two years, and has given every satisfaction:—

Solution A.

Potassic carbonate	4 drachms.
Sodic sulphite	4 ,,
Water	10 ounces.

Solution B.

Strongest ammonia	1 drachm.
Potassic bromide	30 grains.
Water	10 ounces.

Solution C.

Pyrogallol	60 grains.
Water	10 ounces.

A and B will keep indefinitely, but C must be prepared as required. To develope ordinary work take 1 ounce each of A and B and 2 ounces of C. For instantaneous work take 1 ounce each of A and C and 10 drops of B.

◆

A MODIFIED DEVELOPING LAMP.

By C. H. Bothamley, F.C.S.

It is, I take it, established, that for comfort and safety to the eyes and safety to the plate during development it is better that the light should be screened by some translucent material, such as canary medium or golden fabric, whilst, on the other hand, an estimation of the density of a negative is more easily made if the flame is visible, or, in other words, is screened by some transparent substance, such as orange or ruby glass. It is therefore a great convenience to be able to change the character of the illumination as the occasion may require. This is usually done by having different kinds of screens, each sliding in its own groove and capable of being lifted out and replaced either by hand or by means of a string passing over a pulley. The same end is, however, attained much more conveniently by having the lamp attached to a rotating base, and screening different sides of the lamp with different materials.

The base of my lamp consists of a circular piece of wood, A A A, Fig. 1, about three-quarters of an inch thick, with the top carefully planed level and polished with fine sandpaper. Through the centre is fixed a short piece of metal tube, B, which serves as a pivot for the movable part of the base, and as a support for the lamp or candlestick, a piece of narrower tubing being attached to the bottom of the latter and fitting into B. If gas is used, the pipe enters the lamp through the pivot. The movable part of the base is a triangular piece of wood, C C C, with a vertical section, as shown at M N, and of such dimensions that the cardboard sides of the lamp fit over it and rest on the projecting fillet. A hole is bored in the centre of the triangle, and the latter is then fitted on the pivot, B, about which it rotates and carries the lamp with it. The under surface of the triangle is carefully smoothed, and may be rubbed with blacklead to diminish friction.

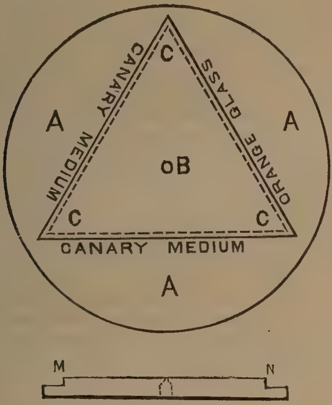

Fig. 1.

The lamp itself is triangular, and is made of cardboard with rectangular openings, as described by Captain Abney in his *Instruction*. A triangular piece of tin, with a rim to keep it in its place, and a hole in the centre to allow the products of combustion to escape, forms the top of the lamp. One of the openings is screened with some transparent substance, whilst the other two are screened with a translucent substance, or three different materials may be used. My own lamp has one opening screened with orange glass, and the other two with canary medium. Whilst development is proceeding, one of the sides screened with the medium faces the operator, but when the plate is to be examined for density a touch with the finger turns the lamp through a third of a revolution and brings the face with the orange glass to the front. As soon as the examination has been made the lamp is turned back to its original position. The change is made easily and rapidly, and there are no pulleys to get out of order nor slides to jam in their grooves.

It is essential to have the base of sufficient diameter to cover the entire sweep of the rotating lamp, since if any part of the latter projects beyond the base it is practically certain to come in contact with some bottle or measuring glass. The rotating portion may be circular, and of the same diameter as the base, with a groove sunk in it to hold the lamp, and two pegs on the upper surface to turn it by. This plan increases the weight of the lamp, but has the advantage of preventing any grit from getting between the base and the rotating part.

It is obvious that the principle can be applied equally well to square or circular lamps, that the base and rotating part may be of metal instead of wood, and that the dimensions of the lamp may be regulated to suit particular cases.

Some difficulty is often experienced in fastening a glass plate against an opening in a sheet of cardboard. The following plan is very simple and answers the purpose perfectly. Fig. 2 represents the back of one of the faces of a lamp such as that just described. The inner lines represent the opening in the cardboard. The second rectangle is the glass, and the outer rectangle is the outer edge of the cardboard. Eight holes are bored through the card in the positions indicated, H H, and moderately stout *copper* wire is passed over the corners of the glass inside, and passes along the face of the cardboard outside, as shown by the dotted lines. If it is required to remove the glass from time to time there should be only one hole on each side at the top, and the wire goes straight across from one side to the other behind the glass.

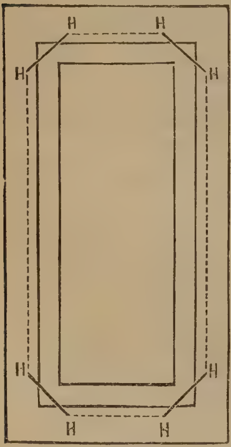

FIG. 2.

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THE ACTION OF LIGHT UPON A SENSITISED FILM.

By J. BARKER.

A SOMEWHAT lively discussion has lately taken place in THE BRITISH JOURNAL OF PHOTOGRAPHY as to the action that takes place in a sensitised film upon the impact of light, and the advocates of the respective theories appear to base their arguments upon the assumption that there is an absolute line of demarcation between chemical and mechanical action; but there is one thing both sides seem to have forgotten, namely, to point out where this line is to be drawn, and the difference in these two actions from their point of view.

This, of course, is not the place to go into the question at any length. would therefore submit, as a brief summary, that the primary action of light is in itself purely mechanical, inducing first a molecular change in the constituents of the film in those parts exposed to the action of the light, which change can be, and usually is, converted into chemical action, either by the application of another compound usually termed a 'developer,' or by the prolonged action of light alone.

SOME NOTES ON READY SENSITISED PAPER.

By Arthur H. Elliott, Ph.D. (New York).

I have often heard complaints from those who use ready sensitised paper that it was impossible to obtain purple or black tones with it. On looking into the question for my own information, I encountered the same difficulty, and I immediately set to work to see if I could devise some course of procedure by which those purple-black shades, that are sometimes so desirable, could be secured. I remembered that the addition of acetic acid to the water in which the prints are soaked before toning always gives them a bright red colour, which is very difficult to get rid of when toning afterwards; and as the great difficulty with ready sensitised paper is the persistence of this red colour, I concluded that acetic acid should not be used, and I tried clean water. But still the prints would always get red, although not as bright a colour as when acetic acid was used. I then tried another method, soaking the prints in citrate of soda; yet I failed to secure anything but red prints before toning, and they always remained brownish after toning, even when much time was given in the toning bath. It appeared to me that what was needed for the first soaking bath was some weak alkali that would not precipitate the silver salt, and at the same time would allow of the washing out of the excess of silver nitrate and the preservative used in the preparation of ready sensitised paper. I tried bicarbonate of soda, but gave it up as it made the prints muddy and gave them a flat colour, the surface of the paper becoming covered with a fine milky deposit. It is true this deposit disappeared in the fixing bath after toning, but it masked the prints during toning, and although I was not troubled with red prints yet I concluded I would try another alkali, and turned to our old friend ammonia. And here I think I have found a panacea for the ills that ready sensitised paper is heir to.

To secure black tones I always print a very dark colour, so that the details in the shadows are gone and the high lights are very decidedly discoloured. I then soak in water that contains one fluid drachm of aqua ammonia fortis (·880) in every pint of bath. I was told that this would dissolve the albumen, that the prints would blister, that I could not tone them, and other ills were to befall me if I used this alkali. But I used it, it succeeded as a panacea for red prints, and I use it still after a whole summer's experience with a high thermometer.

Having found a method to circumvent the red colour of the prints on ready sensitised paper, the rest of the course of procedure is plain sailing. After taking the prints out of the first soaking bath, I then place them in a dish of clean water, then into the toning bath, and tone until I get the shade of colour I desire. If very black prints are to be made, the paper must be fumed at least half an hour before printing, and the printing must be deep, as mentioned above. If purple or brown shades are sought, then fume less. In the case of decidedly brown tones no fuming is necessary. After toning, the prints are soaked in clean water, and then go to the fixing bath (1 in 8), which also contains ammonia in the proportion of one fluid drachm in a quart; finally, wash thoroughly as usual.

The toning bath I prefer is simply a gold chloride bath, with half an ounce of saturated salt solution in the pint, to which is added enough saturated solution of bicarbonate of soda to *just turn* a piece of red litmus paper placed in it to a distinctly blue shade when the bath is thoroughly stirred, after which two fluid drachms more of the bicarbonate solution are added for every eight ounces of bath. The temperature of the bath should not be over 90° Fahr., or the toning will take place too rapidly and the prints come out flat.

I have used the above method on a great many prints, and have seen it used by others with the same success, and the prints have been admired for their beauty of tone by those who are good judges of such matters. I hope the above notes will prove useful to some of the amateurs who read The British Journal Photographic Almanac.

CHLORIDE OF GOLD: A SIMPLE METHOD TO MAKE.

By Thomas Forrest.

If photographers knew what a simple matter it is to make the above I do not think they would purchase the variable, and sometimes questionable, mixtures sold in tubes; I therefore describe my method in the hope that others will give it a trial, and so save much uncertainty in their toning operations, besides effecting a saving in cost.

The only apparatus required is a basin about half filled with sand, and a glass bottle or flask which will stand heat (the flasks in which salad oil is sold are just the thing). Take a half sovereign, bend it, and put it into the flask, which place in the basin of sand; then mix in a glass measure one drachm nitric and five drachms hydrochloric acid, and add about three drachms of this mixture to the gold in the flask. Place the whole on the hob by the side of the fire, care being taken to turn the mouth of the flask towards the chimney, so that the poisonous fumes may escape. Let it remain an hour or two, giving the flask a gentle circular motion occasionally, when the greater portion of the gold will be dissolved. Pour off the clear liquid into a fifteen-ounce bottle, add a little more of the mixed acids to dissolve the remainder of gold in the flask, then pour off into the fifteen-ounce bottle. Pour eight or ten ounces of water into the flask, give it a shake, and allow the white deposit (chloride of silver) to settle. In the meantime add *gradually* small *lumps* of common whiting to the gold solution in the bottle, till it ceases to effervesce, when all the acid will be neutralised. Then add the water which is in the flask and make up the whole to fifteen ounces with water. This will give a slightly acid solution, which will keep any length of time, containing eight grains chloride of gold to each ounce, being equal to eight fifteen-grain tubes of pure chloride, value about fourteen shillings, at a cost of ten shillings and one penny!

N.B.—It is not advisable to allow the temperature of the contents of the flask to exceed that of boiling water.

GELATINO-CHLORIDE PRINTING-OUT PAPER.

By J. Barker.

Another year's experience with gelatino-chloride printing-out paper has confirmed the opinion I expressed when giving my formula in February, 1885, namely, that this article is destined to supersede albumenised paper. A gelatino-chloride paper is now in the market said to contain citrate of silver; this may, however, be the pioneer of more to follow, as the paper can, and should, be made in two classes—that is, suitable for very thin or very dense negatives, and either glossy or matt surface can be obtained at will. Prints can be obtained in a light that would be quite useless with albumenised paper, and are also richer in appearance. My opinion as to its permanence seems also likely to be verified, as the prints that I have had—one half covered with thick orange paper, the other half uncovered—exposed to all weathers under glass since the above date, do not, as yet, show the slightest difference in the two halves. One serious drawback or hindrance to amateur experimentalists in the preparation of this article, is the difficulty of obtaining suitable paper, as unless the paper is suitable failure is certain; but to those who aim at excellence and, I think, permanence in their prints, I can recommend a trial of this process.

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ON THE PREPARATION OF CANVASES FOR ENLARGEMENT.

By H. Holman.

Those who are anxious to try an enlargement on canvas will think twice before they attempt to coat a raw artists' canvas with gelatino-bromide emulsion. However, it can be done easy enough, but we do not know what may be used in their preparation, therefore it will be safer to have a basis which we are sure will contain nothing impure, will not peel off, and at the same time fulfil the requirements of the artist. After numerous experiments I have found the following emulsion to answer:—

Gelatine	2 drachms.
Water	4 ounces.
Chrome alum	8 grains.
Kaolin	1 ounce.

This forms, when dissolved, a pretty thick emulsion, which may be applied to the canvas with a brush.

The canvas should be of fine texture and well tightened on the stretcher after the first coat. A rub with fine sandpaper will make it as smooth as is necessary, but if the finest surface possible be required a second coat and another rub with the sandpaper will yield a surface as smooth as the finest artists' canvas of commerce, only with this difference, it contains nothing impure and perfectly fit to receive the finest bromide emulsion. This may be made either with ammonia or boiling; personally I prefer the boiled emulsion because it stands rougher usage and is not so easy fogged. Moreover, it will stand any amount of heating. With an ammonia, on the other hand, it is dangerous to exceed 100° Fahr. Nevertheless, excellent paper and canvas can be prepared with ammonia emulsion containing little silver, so that emulsion prepared with ammonia has the advantage of being the cheapest. However, most workers will have their favourite formulæ, therefore we shall suppose we have a good emulsion ready. Take a large hog-hair brush, dip it into the hot emulsion, sweep it quickly over the entire surface, pour from a wide-mouthed jar on to the canvas, and it will flow as easy as collodion.

When the emulsion is set on the canvas it is ready to expose, but I dare say it is more satisfactory to allow it to dry in the usual way. The development is the same as for ordinary bromide paper.

◆

DISSECTED DEVELOPERS.

By Thomas Forrest.

Seeing that the various makers of dry plates give their developing formulæ in such different forms, it becomes necessary for those who, either from necessity or choice, use various makers' plates, to devise some means to obtain uniform and satisfactory results. My own practice is to dissect each formula and so get at the proportions of pyro, bromide, and ammonia, they contain, and then enter them in table form on a card, which I hang in the dark room for ready reference, as follows:—

Proportions of Pyro, Bromide, and Ammonia, contained in two ounces mixed developer for various makers' plates.

Make of Plate.	Pyro.	Bromide.	Ammonia.
Britannia and Ilford ...	4 grains	5 grains	9 minims
Miall's	6 ,,	1⅕ ,,	6⅔ ,,
Fry's 1885	4½ ,,	1⅓ ,,	4½ ,,
Fry's German	4½ ,,	2 ,,	4 ,,
Derwent	4½ ,,	2¼ ,,	4 ,,
Richmond...........	4 ,,	½ ,,	4 ,,

These proportions are easily arrived at by calculating the quantities of each ingredient required to make forty ounces developer, then dividing by twenty. The calculations once made and entered on the card are easily referred to when required, and by keeping standard solutions of pyro, bromide, and ammonia, the proportions are easily regulated to suit any make of plate, and so obtain uniform results with the least possible trouble.

◆

CARELESSNESS OF PLATE AND FILM MAKERS.

By Butler Colman.

In photographic operations points often arise which are marked with the results of most complete absence of thought.

In the summer of 1885, the writer was using a certain make of plates with, on the whole, fair results, but with much trouble arising from the fact that the plates were just too large for the slides. A remonstrance brought an assurance from the makers that they were aware of the defect but that they had taken steps to prevent a recurrence of the trouble. The operations of last summer were consequently entered upon with confidence that all would go well. It soon transpired that the later plates were quite as much too small as the former ones were too large, as at times it was almost impossible to find one in half a dozen which would not drop quite through the slide, consequently an annoying course of wedging up with stumps of matches, &c., became necessary.

To avoid disappointment it is often necessary to carry five dozen exposures, and, with a view to reduce the consequent weight, the adoption of films was recently considered very carefully, but a combination of adversities told seriously against the project. This is how the affair came about. Simultaneously, a pair of film carriers and a packet of films were obtained from different sources. The sample pair had plenty of overlap each side and promised well. When, however, the next ten were received, they had each only about half the former overlap, and it now transpired that the films were only $3\frac{1}{8}$ instead of $3\frac{1}{4}$ wide, so that they would not hold at all. In their leading particulars the carriers are correct for $3\frac{1}{4}$ or even $3\frac{3}{16}$, but if these films are changed the next lot (opened on a journey, perhaps) may be as bad.

Unfortunately, the above mistakes are by no means solitary examples, and they are most discouraging and are peculiarly annoying to one whose mechanical training has been directed towards the highest degree of precision in measuring, fitting, &c.

The above troubles, and others equally bad, have not the remotest connexion with lowest prices or with cheapness of production; they are caused purely by absence of thought. It is *at least* as easy to work true to dimensions as to make these most unfortunate 'shots.' As it is, it often appears to be quite worthy of remark if anything is correct, except where extreme lowness of cost forbids all trifling.

EXHIBITIONS' DAMP WALLS AND HOW TO RENDER THEM HARMLESS TO PHOTOGRAPHS.

By Thomas G. Whaite.

As there are several jubilee and other exhibitions announced for next season, I should like to give my fellow workers the benefit of my experience of damp walls in the Edinburgh International Exhibition. I sent in six frames containing about forty photographs—silver and platinotype. Some were hung on a south-east wall, which was subjected to alternate rain and sun, the others were on an inner wall (dry). After hanging about six weeks my attention was drawn to the silver prints on the south-east wall. These were not only fading rapidly but the mounts were covered with fungi. Notwithstanding repeated applications to be allowed to renew these, it was nearly a month before I was permitted to do this; by that time one frame of silver prints had almost disappeared, and the mounts were spotted and useless. Those on the inner wall have, apparently, not changed even now, after six months' hanging. The platinotypes have also remained unchanged. All my neighbours on this wall were in the same state. On replacing the photographs, I took the precaution of backing them up with *thin* '*Willesden*' *paper*, a little thicker than foreign note-paper; this has preserved the second edition. Why do not the plate makers use this green or brown waterproof 'Willesden?' It is safer and cheaper than paraffined paper.

An amusing incident occurred in answer to my request to remove and renew my prints. I was told I had used 'bad chemicals'—that was the cause of the fading, not the damp of the walls—'*he knew all about photography.*' So I find, after thirty years' professional practice, a 'two-guinea Lancaster set' man 'knows all about it' and I don't!

◆

HOME-MADE ENLARGING APPARATUS.

By Harold Power.

'Father made the box himself, and all out of his own head,' was the remark made by one of my boys to a friend who was questioning the meaning of a large wooden box then standing on the table. No doubt the boy's remark was intended as complimentary to his father, but I am not sure that it was so. The wooden box referred to is my enlarging lantern, and as I sometime since sent you a few remarks on the simple manner in which I enlarge on Eastman's bromide paper from my quarter-plate negatives, I thought that possibly some amateurs who, like myself, do not care to unnecessarily invest in costly apparatus, might like to know how this very inexpensive and perfectly efficient lantern for enlarging is constructed.

Take five pieces of three-eighth pine, which, when screwed together, will form a box 12 × 11 × 8, outside measurement, leaving the back open. In the centre of the front piece cut out a circle for the condenser (mine is six inches), and in the top board at a distance of eight inches from the front cut out an oval about 3 × 2, through which the chimney of the lamp will protrude. Over this, when in use, place the ordinary chimney stack of an optical lantern. The lamp I use is one with a circular wick, and was made for me at a shop close to the corner of Wardour Street, at a cost of 3*s*. 6*d*. Over the open back of this lantern I throw a dark cloth, which answers very well. To carry my lens I have another small open box of similar make, to the bottom of which at the sides I affix two small laths as guides, which serve to keep the lens and condenser perfectly square. To take my negative I have a carrier with a hole made on either side at the proper distance, which I hang on to brass-headed nails affixed to the sides of the condenser. This lantern I constantly use, and find answer admirably. It is clean, roomy, and inexpensive.

◆

ANOTHER PYRO AND POTASH DEVELOPER.

By W. I. Lincoln Adams (New York).

In America the pyrogallic acid developer has long been in the ascendency. It is used here in all of its modified forms with ammonia, soda, and potash, separately and combined, but within the past year carbonate of potash has undoubtedly become the favourite. Now so many photographers have their own special formula for mixing this developer that one is almost safe in saying that in the States there are as many carbonate of potash and pyro developers as there are photographers, and the number of both is steadily increasing.

The formula which I am about to give, however, is employed by a very large number of photographers here, it being a developer extensively manufactured and sold by a leading photographic supply house in this country.

The formula is as follows :—

No. 1.

Water	10 ounces.
Sulphite of soda (cryst.)	4 ,,
Sulphurous acid	4 ,,
Pyrogallic acid (Schering's)	1 ounce.

No. 2.

Water	10 ounces.
Carbonate of soda	1 ounce.
,, potash	3 ounces.

The normal developer is formed by taking of

Water	1 ounce,
No. 1 solution	1 drachm,
No. 2 solution	1 ,,

and, when necessary, by adding a few drops of ten per cent. solution of bromide of potassium.

The sulphurous acid preserves the pyrogallol so that the developer remains clear and colourless for months after it is prepared. When mixed and poured over the plate it still retains its clearness, and does not stain the film in any perceptible degree, or the fingers of the operator.

So much acid, however, tends to make the developer work a little slow, perhaps, but this can hardly be accounted a fault in these days of extremely rapid dry plates.

SULPHUR AND LIGHT.

By Robert Offord.

Among the papers read before the British Association last year was one which treated of the above subject. Two experiments recorded there are worth noting, as having a distinct bearing upon the fading of silver prints. The point at issue was the possible substitution of sulphur for the more expensive selenium in the contrivance known as the selenium cell. It has often been suggested to employ one of these instruments in conjunction with a delicate galvanometer and a convenient battery for the purpose of an actinometer. If sulphur is available as a resistance capable of being acted upon by light, this suggestion is, of course, far more easily carried out in practice, and a simple differential galvanometer would not be at all difficult of construction.

Experiments in the direction of sulphur cells have been carried out, and one point is especially worthy of notice, as leading to that which is of more direct importance to photographers. Both with selenium and with sulphur cells it was clearly demonstrated that the presence of metallic selenides or sulphides really produced the effect of rendering the cell sensitive to the influence of light, the resistance of the cell being reduced con siderably in proportion to the amount of light impinging upon its surface. This being so, the next step was to mix silver sulphide and sulphur, which, in conjunction with silver electrodes, formed the cell. The intervention of an alum solution elicited the fact that heat does not affect the increase of conductivity, but only the light. Indeed, when silver sulphide and sulphur were present in equal proportions, heat produced the opposite effect to light. Sulphur alone has an enormously high resistance, and when a current is passed between silver electrodes, silver is deposited upon one conductor and sulphur on the other. This does not stop the action of the cell, for the simple reason that the sulphur at once combines with the silver forming the conductor, and sulphide of silver is the result.

Hence we come to the question, What facilitates the most rapid production of this sulphide? And in the reply we have a possible solution of part of the problem respecting the fading of silver prints.

The question is answered by the word *light*, and the two following experiments are offered in support of the hypothesis. I quote from Mr. Shelford Bidwell's paper: 'A glass plate covered with silver leaf was placed, with the silvered side downwards, over a crucible of boiling sulphur. One half of the plate was covered with a piece of black cloth, and the arrangement was exposed to bright sunshine. In a short time the visible portion of the silver was darkened, owing to its partial conversion into sulphide; the cloth was then removed, and the silver beneath it was found to be scarcely discoloured.' Of course, the cloth was outside the glass.

In case unequal condensation may have produced the effect, the next experiment was performed as follows: The silver leaf was brushed over with a solution of sulphur in carbon disulphide, and was placed in cold water to keep the temperature 'low and uniform.' A board being arranged to cover half the surface, the sunlight fell only upon the other half, with the result that the exposed portion of the silver became 'dark brown' in fifteen minutes, while that which was protected 'was of a pale yellow tint.' Photographers, in their daily practice, could point to plenty of instances giving perhaps equally strong evidence that 'the combination of sulphur with silver is assisted by light,' not only in the case of partially washed albumen prints, but also in that of gelatine negatives which have received only a short soaking in one water and a couple of rinsings under the tap. The extreme cases cited above are very suggestive, and their consideration may perhaps lead to some clearer understanding upon the subject.

PYRO FOR SILVER INTENSIFICATION.

By H. Y. E. Cotesworth.

Possibly very few dry-plate workers now use silver intensification, hence the widespread employment of sulphite of soda has, perhaps, not shown to very many as it has to myself that there are circumstances under which it is rather a nuisance. I allude to the use of sulpho-pyrogallol in connexion with silver intensification.

The mere fact that the sulphite precipitates sulphite of silver, which in turn is reduced by the pyro, would not be a serious matter when the operator is aware of and prepared for the fact; but when, as in my case, I never thought of it until I had ocular demonstration of it, and I had no pyro but what was in solution with sulphite, it is, to say the least, annoying.

Since that discovery I invariably keep a separate bottle of pyro solution preserved with citric acid, solely for use with silver as an intensifier. I do not use this for alkaline development, because, even when the acid is allowed for, I strongly object to the retarding action of the citrate in the development.

My solutions are as follows:—

No. 1.

Pyro	48 grains.
Citric acid	15 ,,
Water	1 ounce.

No. 2.

Nitrate of silver	60 grains.
Nitric acid	40 ,,
Water	1 ounce.

Dissolve the citric acid first and then the pyro. For two ounces of intensifier to be used in a dish, I take half a drachm each of No. 1 and No. 2 and make up with water, adding more silver as required. If I intensify without the dish, as I usually do, I mix fifteen minims of each with one drachm of glycerine and three drachms of water, and pour it on and off the plate, as with collodion.

REPRODUCTION.—PHOTOGRAPHY IN HOT CLIMATES.

By C. Heinrich Trinks.

Most of us know the two great enemies of reproduction—granularity and reflection—and many remedies have been proposed. We must bear in mind that granularity in the resulting negative is but the effect of the shadows of the texture of the paper, and counteract this by illuminating the original equally all over 'from all sides.'

In practice, subject your original to a top light, against some wall, or, better, movable vertical artist's easel, at the foot of which attach a large sheet of cardboard, thus hinged at the back that it can be moved up and down like the lid of a box, thereby reflecting the light upwards. Similar screens are arranged at the sides of the easel. For those who wish for a more complete arrangement I should recommend in addition the following apparatus, which everybody can make for himself at a nominal cost. Fix a longish stick in a baseboard so as to form a stand, then procure a piece of large cardboard; keep it white on one side, and blacken it on the other. By means of a string this board can be easily hung on to the stand at any height, and also by means of a peg, interposed at the back, throw out the board to any required angle. Make two of these stands. When the white sides of these screens are placed obliquely against the original, it will further illuminate it, and can also be made to remedy any previous faults of lighting. When the black surfaces are used, it will tend to deaden reflection of glass or highly albumenised surfaces. When shiny surfaces have to be photographed avoid front light.

Photography in Hot Climates.—I have had ample opportunity in the

Orient to expose and develope under trying circumstances from actinity and extreme heat. My experience has been that it is the best plan to treat the negatives as over exposed. Some people *may* be able to judge exposure to a second, and even less, in a light well known to them, but if you have to do with plates of high rapidity, and work with rapid lenses, and then have to judge if $\frac{1}{100}$ part of a second or $\frac{1}{20}$ would be right, I think a few more people besides myself would be fairly puzzled; and yet, if a $\frac{1}{100}$ part of a second was right, and you gave $\frac{1}{20}$, the plate would be just as well five times over exposed as if one second being right and you gave five. Anyhow, if you could judge so accurately, first find a practical shutter to carry out your wishes. Another circumstance also tends in the direction of over exposure, and that is the raised temperature of the developer, and it is surprising to what extend this must be taken into account.

It is very much easier and better to try to remedy any defects in modifying the development. I use the ordinary pyro ammonia developer and citric acid, which, as it combines with the ammonia, forms citrate of ammonia, being a very powerful restrainer. This is what I want—a deferred development, which gives me time to judge and keep the action of the chemicals under my control.

For a very long time I have been trying to get as clear shadowed negatives as possible—this, I believe, is the aim of most amateurs—but recently I have been obliged to admit that negatives which are slightly matt, a ground-glass sort of appearance, are by far more serviceable for ordinary printing.

With regard to heat, I think I have tried most of the methods advocated for guarding the plate, such as edging the plate with butter or india-rubber solution, soaking the plate before or after development in alum or chrome alum, coating the exposed plate with collodion, or what was most recently advocated, with a weak solution of gelatine, also cooling solutions such as nitrate of ammonia, &c. All these methods are more or less effective, but have all got disadvantages on which I cannot enter here, so let me just describe how I set about getting over the difficulty in Athens under really very trying circumstances—it is simple, inexpensive, and effective. They have, in hot climates, a sort of unglazed, porous, earthenware jug (in Greece called 'Stamna'); this filled with water is placed down in the well, or in default of this in a bucket of water, when desired for use—drinking or developing—it is withdrawn, and the well-known law of surface evaporation keeps the water cool. Cost of jug, 2*d*.

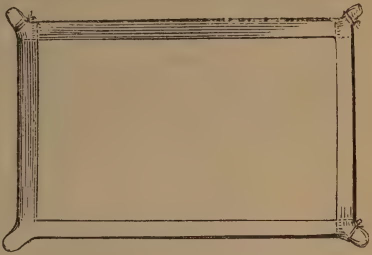
COMMON THINGS.

By Thomas Samuels.

The simplified practice of photography has induced many to become amateurs in the art who have but limited facilities or means for indulging in the luxuries provided by manufacturers of apparatus, while others for recreation prefer to manufacture for themselves, or to adapt the means at hand to their requirements. Cases of emergency will occur to all. A notice of the following common things and hints may prove useful to some of my fellow amateurs.

Linoleum of uniform colour is very suitable for a background, both outdoor and in. It is not spoiled by damp or drippings of water, and drawings or shadings may be readily made on it, and easily washed off without damage to the material.

Willesden paper of a proper thickness answers well for developing trays, also for alum, hypo, and washing baths. To make them, cut the paper to the size required, draw lines parallel to and equidistant from each edge, and turn up on these lines the portions thus forming the sides of the tray. Wetting the paper first, helps the operation. Three of the projecting corners should be fastened with string, or, better, with a small spring clip. A copper one used for picture hanging answers well. The fourth corner is left for pouring from. These trays may be carried flat when travelling, or pieces be taken on a journey for emergencies. Capital water-tight packing cases that wear well can easily be made with it.



An old quill pen is useful—the quill part to raise the plate from the developing solution, and the feather part to cleanse the tray with when development is finished. A brush for this latter purpose may be made by tying a piece of lamb's-wool cotton on one end of a strip of wood.

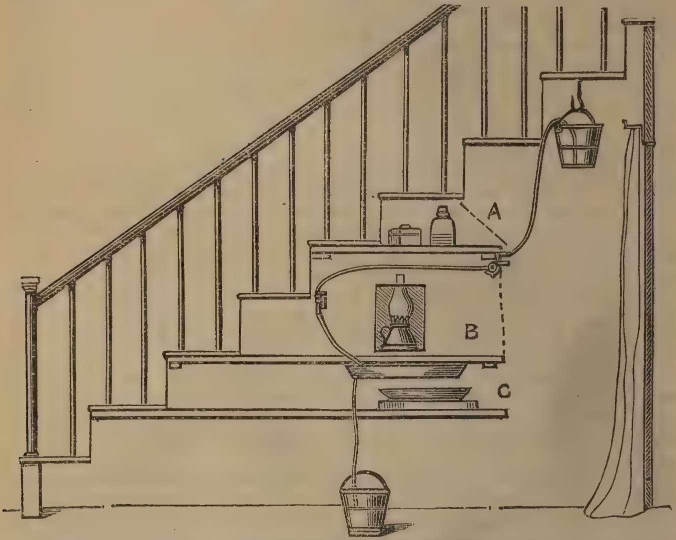
Fixing baths are readily made from a saturated solution of hypo of soda made in a wide-mouthed bottle, on the neck of which is kept a footless wine glass to be used as a measure and keep out dust. Saturation is maintained by always having undissolved crystals in the bottle. When mixing according to the usual formulæ, a glassful is the 'one part,' and '— parts' so many glassfuls of water.

When canary medium or other paper is used in lighting the operating room, place it between squares of glass to protect it from smoke, fracture, and splashes.

Dry plates packed in groove boxes are difficult to remove one at a time. To make the operation easy, cut away from the top of each end of the boxes just sufficient to allow a finger-hold on the top corners of each plate. I suggested to a manufacturer of dry plates the utility of having his boxes made so, and forwarded him an old wet collodion plate box as a model. Application has since been made to patent the principle. Notwithstanding, I believe we may all do as suggested.

A yellow varnish for the inside of dark tents or boxes is easily made by mixing chrome yellow with methylated French polish. It can be applied with a brush and dries quickly. Stephens's ebony stain is handy for blacking apparatus.

The cupboard under the stairs (or cellar entrance, if there) offers peculiar facilities for using it as a *dark room*. First look to the entrance and prevent light entering by fixing indiarubber dust excluder, or strips of wood with list on the face round the door. Look to the keyhole and stop up all chinks. Choose the step on the inside of the comfortable height for working, and support a shelf on strips of wood fixed in a line with it to the stringboards of the staircase. This is for the developing table, and should be three steps wide. Make in the front part of it, of wood or metal, a sink with waste pipe attached, and provide a frame to support the developing trays over it. The back part may be used to store the bottles in use. If convenient, convey the water to the sink from a tank outside, fixing the tap on the step above the sink; or the water tank may be hung on a hook inside, out of the way. The waste water should, if possible, be conveyed right away, or to a vessel placed on the floor, as large as the water tank. Below the developing table fix as before a shelf for the alum and fixing baths. This may be made to slide out of the way on the supporting strips of wood. Another shelf fixed two steps above the developing table will be found convenient for plate boxes, backs, or other apparatus



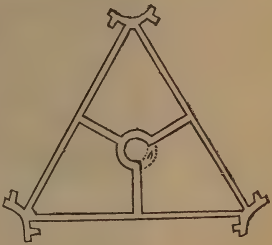
A. Shelf for plate boxes. B. Developing table. C. Shelf for fixing and other baths.

not used while developing. A dark curtain should be hung in front of it from the step above. A curtain may also be provided to enclose the developing table and apparatus there when not in use. The whole may be coloured yellow with advantage. The lighting may be with any dark-room lamp, but a preferable method is to cut a hole, from six to nine inches square, in the outside spandrel of the staircase opposite the developing table. The piece of wood cut out should be hinged to drop outwards and form a stand for any ordinary lamp or candle, and to close the opening when done with. The hole is glazed on the inside with two sheets of glass, having a thickness of canary medium between them. Another thickness so protected with glasses, or a square of coloured glass, is provided to run in grooves in front of it, to be used as desired for reducing the light. A further protection to the plates may be provided, without excluding too much light, by having a square of wood, or wood and paper, hinged to the near side of the window in such a manner that it may be swung round in front of it, and so place the plates in shadow. This plan requires no special lamp, illumines the developing table all over, and gives full control over the lighting. The heat and fumes of the lamp also are outside the operating room.

A QUICK WAY OF FIXING THE CAMERA TO TRIPOD HEAD.

By W. Horton.

Nearly every photographer knows what a delay is often caused in attempting to find the hole in baseboard of camera when fixing it on the tripod. By cutting a slit in centre hole of triangle (see diagram), passing the head of screw through the opening into which the slit is made and slipping it into the centre hole, the camera can be affixed with a turn or two, and put on or taken off without removing the screw.



This arrangement is particularly useful if you do not possess a square camera, as a second screw can be kept in the side and the change from horizontal to vertical, or *vice versâ*, quickly made.

The annexed diagram will explain my meaning. A, shows part cut out.

A ROCKING MACHINE, AND THE DEVELOPMENT OF GELATINE PLATES.

By F. P. Leon.

One of my earliest experiments with gelatine plates was to take two negatives, the only difference between them being that one was rocked during the whole time of development, while the other was placed on a table for the same time and left without being touched. The result was that the one rocked was a good dense negative, the one still was little more than a phantom image. It is obvious that for the whole time of development the plate ought to be kept in motion; for a long development a rocking machine is therefore an absolute necessity. My first rocking machine was made by cutting a hole in the table, putting through this a stick with a weight at the bottom, an iron nail for the fulcrum near the top, and a little table for the developing dish at the top of all. This machine served me for years, but I was not satisfied with it because it often would not rock for a sufficiently long time; if I went away for a few minutes I found, on returning, the thing at an absolute standstill.

Now I have a multitude of volumes called the *English Cyclopædia*.

In this I thought I should find the information I required, there being an article of several columns under the head "Pendulum." I therefore carefully read through it, and derived a good deal of information about the number of swings per minute and the principle as applied to clocks, each of which, of course, has a motive power, but not a word could I find about the duration of time a pendulum would swing that had only the motive power of the original impulse. It was necessary therefore to experiment, and I soon found that the duration of motion is directly proportional to the difference between the weight below the fulcrum and that above. Thus, using a four-pound weight at the bottom, the motion continued much longer when developing a quarter-plate than in performing the same operation on a whole-plate. It was obvious therefore that a more efficient instrument could be made by making the table and plate themselves the weight, and having no weight above the fulcrum. I therefore rigged up a machine suspended by four wires, one to each

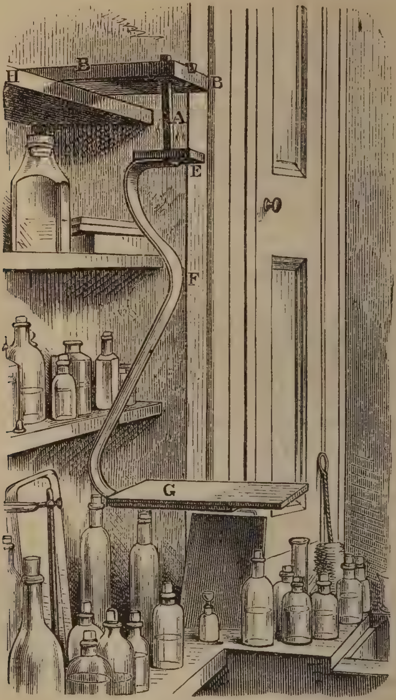


Fig. 1.

corner of the rocking table. This answered better, but the wires were an intolerable nuisance, always getting in the way when anything was taken on or off. Well, to make a long story short, I at last got at an iron shop in my neighbourhood a piece of iron 4 ft. × 3 in. × $\frac{1}{8}$ in., with which I constructed an absolutely perfect instrument. At first there was a difficulty about the table hanging level, but by bending the iron as shown this was quite got over, and it is now perfectly level when at rest. Fig. 1 explains itself, with the exception of the plan of the top, which is shown in Fig. 2 about half size. Fig. 3 is a section through the length of D. A in Fig. 2 is the top of a piece of wood seven inches long, the bottom of which is screwed firmly to the piece of wood, E, which is also screwed, with four screws, to the iron, F. The table, G, is screwed to the iron, F, by four screws. The fulcrum, C, and the supports, D, may be made of large French nails, or, better, of steel rod. B is of course a board screwed to the old shelf, H. This shelf is six feet nine inches from the ground. The whole machine is about two feet nine inches long, so that it is four feet above the ground, and well above the bottles on the fixed table, which is two feet six inches high. Any one can make it in about an hour, and at a cost of about 1*s.*; the iron costs 7*d.* I should suggest to Messrs. Houghton, who have recently designed such a good tank, that they should supply these rocking machines at a cost of 5*s.* or 7*s.* 6*d.*, which would leave a handsome profit. The rod, C, should be at least eight inches long, and the supports, D D, six inches apart. This machine will continue rocking for two hours—at least, that is the time mine rocks. The rod, C, should be filed to a knife-edge at the bottom where it touches the supports. If these parts are made of hardened steel I am sure it will rock for four or five hours.

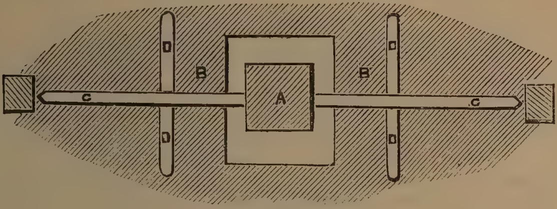


Fig. 2.

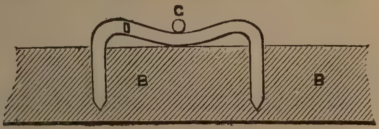


Fig. 3.

I wish to say a few words about the development of gelatino-bromide plates. If the reader will refer to an article by me in The British Journal of Photography of May 29, 1885, he will find there tests and formulæ to which I still adhere. To briefly recapitulate, as many may not have the number by them, I here give formulæ.

For under-exposed plates, or plates suspected to be under exposed, develope with

Pryo	9 grains.
Ammonia	3 minims.
Water	1 ounce.
Bromide	*none.*

This is a little stronger than was recommended in the article referred to, but I find it is better and more rapid; the proportions are the same. I have tried immersing the plate in ammonia first, then washing thoroughly, and developing as usual. I find that it is impossible to develope such a plate without bromide, as the ammonia never seems to be entirely removed, and the excess of ammonia, say, only for one second, causes fog, which of course is intensified by the subsequent development. When using bromide, the advantage, if any, which I doubt, is not equal to that of omitting the bromide entirely and using instead an excess of pyro from the first. For a plate not known to be under exposed, but found to be so after applying the ordinary developer, I recommend thoroughly washing the plate and then using the formula given above. If this will not save the plate nothing will; it will save the plate if the latter has not had less exposure than one-third the normal. If when using excess of pyro and no bromide it is found that the plate was not under exposed, it will not matter, for the plate will gain density and detail in just the same proportions as if the ordinary developer had been used. I have tried the experiment of giving two negatives exactly the same sufficient exposure to a landscape and developing them one by the ordinary formula the other by the formula for under-exposed plates; the two negatives were undistinguishable one from the other. But I ask my readers to give two plates *one-third* of sufficient exposure, exposing one after the other with the same illumination, then develope one with bromide, another with excess of pyro without bromide, and observe the difference in the results. The former will be spoilt, the latter will be a fairly good negative.

NORMAL DEVELOPER:

Pyro	2 grains.
Ammonia	2 minims.
Potassium bromide	1 grain.
Water	1 ounce.

DEVELOPER FOR OVER-EXPOSED PLATES UP TO 100 TIMES OVER EXPOSED:

Pyro	3 to 8 grains.
Ammonia	2 minims.
Bromide	3 to 8 grains to the ounce.

Increasing the pyro and bromide together is far safer for a very over-exposed plate than increasing the bromide alone, as is generally done. By increasing the bromide alone a ten times over-exposed plate may be saved, but not a hundred times one.

The above formulæ are suited to all the best plates in the market (I have tried them all), but for a plate giving habitually insufficient density the following is better as a normal developer :—

Pyro	2 grains.
Ammonia	4 minims.
Bromide	2 grains.
Water	1 ounce.

Ammonia or bromide in excess give a harder negative (with more contrast), pyro in excess gives a softer negative (with less contrast).

◆

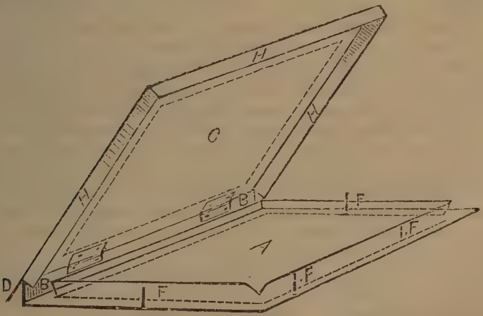
A COMBINED LIGHT SCREEN AND DEVELOPING DISH HOLDER.

By Richard Crowe.

A few dodges have been, and are still resorted to, to screen the (supposed but doubted) non-actinic light of the dark-room window from the sensitive plate when in the developing dish, especially under prolonged development. Some of these I have seen used, and tried myself, viz., covering with a piece of board, dark slide, coloured glass, book, lid of box, &c. Any one of these will answer very well if you do not happen to lay it aside just at the wrong moment, such as the sudden opening of the dark-room door, or some one wanting to have a word with you, when, as a rule, there is a search in the dim light for the something to cover up the dish and plate before the password is given 'all right.'

A good substitute for the above makeshifts will be found in the combined dish holder and screen, which I have the pleasure to offer as my contribution to this year's Almanac. The above is best described as a light made box, one side of which is attached to the bottom or dish holder. The lid, which is a mere rim, carrying the other three sides, is hinged to the side attached to the bottom, so that when closed it will form a complete box, the rim or lid being covered with some translucent, non-actinic material.

By referring to the diagram, very little further explanation will be required.



A represents a piece of thin ebonite of suitable size turned up at one side, B B, to which is hinged the rim or lid C, carrying the three slides H H H and the coloured covering indicated by the dotted line. The back part of the lid D is carried beyond where it is hinged, so that when it is held in the hand, by placing the finger on the part D, it acts as a lever and lifts the cover without the aid of the other hand; when pressure is taken off, it will close and screen the plate in an instant. The lower portion has four pins, F F F F, screwed in of sufficient length to keep the dish indicated by the dotted lines from slipping off when held up to pour off the developer. If the lower part or plate holder is made in wood, it should be well varnished to protect it from the solutions, &c.

◆

POTASH A CAUSE OF FRILLING.

By Horace Warren Gridley (New York).

Last summer I had a somewhat singular experience regarding frilling, and although in the end I succeeded in 'frustrating the enemy' it caused me, however, the loss of a dozen beautiful negatives which it was impossible for me to replace.

In July, intending to make a somewhat lengthy sojourn in Switzerland, I ordered of one of the largest and best known plate makers in London one gross of 10 × 8 plates and took them with me to St. Moritz, in the Engadine. As I intended to develope *en route* I selected a potash developer, not that I think potash possesses any advantages over ammonia, in fact, I prefer the latter, but in travelling potash is certainly much easier to carry, and not volatile like ammonia.

My first use of the plates was near St. Moritz. I took a dozen negatives, came home to my hotel, and in the evening went to my dark room to develope my hard day's work. The negatives 'came up' beautifully, exposure correct, &c. But, alas! they were doomed, and frilling was the cause, an evil which I had not been troubled with for years. I was using distilled water, and, thinking that might be the cause of the frilling, I changed to glacier water iced, but the frilling continued; soaked the plates in sulphate magnesium (Epsom salts) before development—it did no good; alum was also useless. What was I to do, over a thousand miles away from London, with a gross of useless plates? and last, but not least, it had cost me over 4*l.* to get them to my destination. So I gave up in despair, and did not take another photograph for over a week.

Thinking it over one day, it suddenly occurred to me that the osmotic action of potassium carbonate is very great, and that might be the cause of all my trouble. Knowing that the osmotic action of caustic ammonium is very small, I determined to try it, so I took a dozen negatives and used the same developer, but substituting ammonia instead of carbonate of potash, and the result was that I developed the whole dozen without the least sign of frilling, and at the end of two months had developed the remaining eleven dozen plates, and not one of the plates showed the slightest trace of puckering.

So I think I may safely say I had discovered the cause of the frilling and a remedy for the same. All my trouble was certainly caused by the use of potassium carbonate. This is easily explained when you consider the strong osmotic action of this alkali.

I therefore advise all those who use the carbonates of the alkali metals in their developers, if they are ever troubled with frilling, to substitute liquor ammonia before adopting more troublesome measures, such as soaking the plate in chrome or potash alum, which in my opinion should never touch the plate until it is fixed.

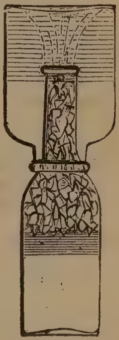
◆

AN AUTOMATIC APPARATUS FOR MAKING SATURATED SOLUTIONS.

By C. Beckett Lloyd.

Nowadays, when so many of the chemicals in daily use by the photographer are ordered to be used in 'saturated solution,' I have no doubt others besides myself have experienced the nuisance and uncertainty of having to make a saturated solution at short notice. The apparatus—if its simplicity entitles it to the term—to be described has saved me much trouble in this respect, and as it costs practically nothing it may be found useful by others.

It consists simply of two bottles or jars of suitable capacity and of different shape, one being wide mouthed, the other narrower and longer in the neck, such as may be found almost as waste in any household. What I employ myself are the squat, wide-mouthed glass jars used by some of the jam manufacturers, which can be had of one, two, or three pounds' capacity, perhaps larger, and the longer shaped bottles employed by the same people for bottling fresh fruit. These are like an ordinary wine bottle in shape but with a wide neck, and the size I use hold about a pint. The diagram will give an idea of what the relative dimensions should be.



The crystals to be dissolved are placed in the narrower-necked bottle, a little water poured in to partly fill the interstices, and a piece of muslin, coarse canvas, or similar material tied over the mouth. Into the wide-mouthed jar a quantity of plain water is put, into which the other vessel is inverted, its mouth just dipping below the surface. Solution and diffusion commence at once, and go on until the liquid in the lower vessel is saturated. An occasional swirl round of the jar will help matters, but is not necessary unless the solution is required for use in a short time.

A word may be said as to the quantity of water to use in the lower vessel. If the narrow-necked bottle be filled with water alone and inserted into the empty jar, the water will escape into the latter until it rises to such a height as to close the orifice of the upper bottle, when further flow ceases. In actual use, if the crystals do not lie so close as to altogether prevent the escape of the water, the same course may be adopted; but it will be found better to fill the jar to a point a little lower than the aperture of the second bottle, and to permit it to fill itself to the requisite height by drainage from the crystals. As soon as the contents of the two bottles come into communication solution commences, and will go on with gradually decreasing rapidity until saturation is reached.

Any water in the lower jar reaching higher than the point mentioned will be useless, or worse; therefore, to make the most of the space at command, the neck of the upper bottle should be considerably shorter than in the diagram.

I leave the arrangement to work by itself, every now and then giving a shake round to the contents of the jar. At intervals, or when I find that the different layers of liquid are homogeneous, I pour the saturated solution into a stock bottle, and set the apparatus going afresh. In this manner I am always supplied with stock, without the constant trouble of shaking or stirring required when the salt is allowed to lie at the bottom of a bottle or jar.

◆

SODIUM HYPOSULPHITE AND THE FERROUS-OXALATE DEVELOPER.

By A. Treyer Evans.

What takes place when a small quantity of sodium hyposulphite is added to the ferrous-oxalate developer? Any one who has tried dipping their finger into the fixing bath and stirring it up in the developer would say, 'Why, it hastens development;' most certainly it does, but how? Some have said that this increased energy is due to the formation of iron hyposulphite; others, by the destroying of ferrous bromide formed during development; whilst others have shown that ferric oxalate has been formed by the oxalate of potassium having been previously acidified by oxalic acid, and that this ferric salt has been reduced to the ferrous state by the addition of hyposulphite of soda.

All these theories may be correct and based upon good grounds, but they all differ from my theories and experiments made in this direction. The first idea is this:—

Put a few large crystals of hyposulphite of soda into a test-tube, pour upon them a strong solution of acidified ferric oxalate, and instantly a deep ruby solution of the double oxalate of sodium and iron is formed thus:—

$$\overset{\substack{\text{Ferric}\\\text{Oxalate.}}}{Fe_2\,(C_2\,O_4)_3} + \overset{\substack{\text{Sodium}\\\text{Hyposulphite.}}}{Na_2\,S_2\,O_3} = \overset{\substack{\text{Double Oxalate of}\\\text{Iron and Sodium.}}}{Na_2\,Fe\,(C_2\,O_4)_2} + \overset{\substack{\text{Ferrous}\\\text{Hyposulphite.}}}{Fe\,S_2\,O_3} + \overset{\substack{\text{Carbonic}\\\text{Anhydride.}}}{2\,CO_2}.$$

Whence it will be seen that the ferric salt has been entirely converted into ferrous, and from which it may rightly be believed that 'when a hyposulphite is added to an acidified ferric salt it reduces it to the ferrous state.' Then one would say, 'How does this ferric salt creep in the developer?'

Little do amateurs and beginners of this 'black art' know the sensible importance of having pure ferrous sulphate with which to compound their developer; reject any of this salt unless of an apple green colour in crystals and in solution, as when yellow or yellowish green it is a destroyer, and not a developer, of '*potential images.*' Let a solution of ferrous sulphate be exposed to air for only a few minutes its surface will be converted to ferric sulphate, and only when a small quantity of this latter body is present in the developer development is retarded: this may be proved by adding a few drops of its solution to the developer when developing a gelatino-bromide dry plate. Hence we see how the rapidly changing ferrous salts get contaminated with the ferric, and thereby their developing powers become dissipated and finally *nil.*

The following equation shows how ferric oxalate is formed when using a bad sample of ferrous sulphate :—

Potassic Oxalate.   Ferrous and Ferric Sulphates.

$$27\,K_2\,C_2\,O_4 + 12\,Fe\,SO_4 + Fe_2\,(SO_4)_3 =$$

Double Oxalate of Potassium and Iron.   Ferric Oxalate.   Potassium Sulphate.

$$12\,K_2\,Fe\,(C_2\,O_4)_2 + Fe_2\,(C_2\,O_4)_3 + 15\,K_2\,SO_4.$$

Now this may be taken as positively correct, and I think every one will admit that when we take twenty-seven parts of potassium oxalate and twelve of ferrous sulphate contaminated with one part of ferric sulphate that we obtain, after admixture, fifteen parts of potassium sulphate, one of ferric oxalate, and twelve of double oxalate of potassium and iron. Whence we see from this rationale that ferric oxalate is present, although in small quantity; but the longer the ferrous sulphate or the resulting double oxalate is exposed to air, or the greater the surface of contact with the air, the greater the amount of the ferric salt exists in the solution exposed.

Another and yet more evident proof of the reduction of ferric oxalate may be understood by the following:—

If to a solution of acidified ferric oxalate be added a solution of ferricyanide of potash, a greenish yellow coloration is the result, indicating the presence of a ferric salt; if now to this solution a crystal of sodium hyposulphite be added a deep blue precipitate of Turnbull's blue is formed gradually as the crystal dissolves. This is a self-evident proof from which the reader may glean that the ferric salt has been converted into a ferrous, which causes that intensely blue precipitate.

If, again, we repeat this experiment, only substituting an alkaline sample of ferric oxalate, we fail to produce that blue precipitate which would indicate the presence of a ferrous salt; therefore, 'when ferric oxalate is neutral (by means of sodium carbonate neutralisation may be effected) reduction does not take place.'

If to the solution made in proving the above experiment a drop of acetic or any other acid be added the blue precipitate is instantly formed as the acid diffuses through the liquid, and thereby corroborating the theory I have here set forth.

I have used ferric oxalate to explain my experiments, being more in accordance with developers, but the perchloride of iron may be substituted with advantage, as its deportment is precisely similar. If the one half of an exposed piece of gelatino-bromide paper be dipped into a solution of sodium hyposulphite (1 to 1000) and developed with an *alkaline* sample of ferrous oxalate developer, the portion that received the wash of hypo flashes out almost immediately it is immersed in the developer, and after fixing shows a marked degree in intensity over that part developed in its normal state. This experiment tends to prove that reduction does take place in an alkaline ferrous oxalate developer, therefore it does not agree with, and is *ipso facto* opposed to, the last experiment I explained. It yet remains to be traced out why they do not correspond in behaviour, and I think some unforeseen idea may crop up to avaunt this perplexity.

Sulphite of soda and a solution of sulphurous acid both accelerate development, but they are not nearly so active as the thiosulphate; whether these are new imports or not I cannot say, having never read or heard any account relating to their application to acceleration, but in some instances they may prove useful where partial reversal is suspected, and where hypo would be favourable to reversal by its greater solvent action upon the silver haloid.

PREVENTING THE DETERIORATION OF DEVELOPING SOLUTIONS.

By T. H. Norris.

Those practising photography have often found the rapid deterioration of solutions of pyro, ferrous oxalate, and ferrous sulphate, a great inconvenience, and various methods have been proposed for preserving these solutions, such being the well-known addition of citric acid, nitric acid, or of sulphite of soda to pyro, having a layer of paraffine oil, or completely filling the bottles containing ferrous oxalate, or immersing bright iron wire in the ferrous sulphate; but, however effectual these methods may be, they are all for the same end, namely, to prevent the absorption of oxygen by the solution.

A method which I have used for the last twelve months or more, and which I find preferable to all, was the result of being occasionally obliged to take a negative at mid-day, and produce a finished lantern picture to be shown the same evening, as well as take part in work (having no connexion with photography) during the time, therefore necessitating having solutions ready for use when required. This was accomplished by the simple method of displacing the air in the bottle with coal gas. Since first tried, I have made experiments with a view to prove its usefulness, and find that a solution of three grains of pyro to an ounce of distilled water will keep at least six months, whereas a similar solution preserved with a few drops of nitric acid was quite black and useless in a month.

A saturated solution of ferrous sulphate was also made twelve months ago and put in a bottle having an indiarubber stopper; this solution is now as active and of as good a colour as when first made, care being taken to blow in coal gas after every withdrawal of solution. The best plan of filling the bottle with coal gas is to attach a piece of rubber tube to a gas tap, put the tube in the bottle containing the solution, and turn the tap full on while counting twelve, then rapidly stopper the bottle. This should not be done in the dark room, as the injurious effects of coal gas on plates may become apparent.

QUICK ACTING SHUTTERS.

By Richard Parr.

Every shutter that I have tried thus far, and that is in the market, has some fault which greatly impairs its worth for small, sharply-defined negatives intended for enlargement.

My plan is to test them on the optical lantern, and I find that, practically, the 'go and return' shutter fitted in the stop slot of the lens mount is all that can be desired, both for portability, rapidity, and extra exposure to foreground, but for one serious defect, *i.e.*, a considerable amount of vibration at the critical moment when the lens is full open, caused by the reversal of the motion of the shutter. This is (for my purpose at all events) a fatal objection, and after making many troublesome experiments I had to come back to first principles in the form of the simple drop shutter, in which, *reversed*, I found my *desiderata*, namely, about ten per cent. excess of exposure for the foreground, a rapid exposure, and a minimum of vibration. I should probably have overlooked the first of these advantages had I not used the lantern for testing, as, with it, the falling shutter of course exposed the foreground first, and at that moment was moving very slowly, while the vibration resulting from its stoppage occurred after the exposure was completed, and when it could do no harm—from this I saw at once that by causing my shutter to *fall* (?) *upwards* I should get what I wanted. I have done this by making it of No. 30 B. W. gauge hard opticians' sheet brass, to slip into the 'stop' slot of the lens mount, which is cut right through the bottom to allow the shutter to be pulled down through it; the frame of the shutter forms the 'stop' and has the aperture cut in it, and the shutter slides in front of this in grooves made by turning up the edges. The shutter is held down when 'set' by a very small catch below the lens mount, and it is drawn up by a watch-spring so set that its tension can be increased or reduced according to the length of exposure desired. The whole concern for a Steinheil aplanat of five-eighths of an inch aperture weighs under one ounce, and the moving part about ten grains.

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DISTORTED PORTRAITS CAUSED BY EXPANSION OF PAPER.

By W. H. Prestwich.

It is within the experience of most photographers that considerable difference exist in the proportions of the human face, especially in the case of large heads, according to the way in which the paper has been cut, that is, whether it has been cut lengthwise or crosswise, and when mounted wet. The difference of a sixteenth of an inch makes all the difference as to the accuracy of the face.

In some countries, Germany for instance, where the type of face is broad, it is the practice of some photographers to cut the paper crosswise so as to diminish this characteristic as much as possible. In my own practice, on the contrary, I am in the habit of cutting the paper lengthwise.

Of course it will be readily seen that if prints were first dried before being mounted, by which the fibres of the paper will have resumed their normal position, all difficulty would be avoided, and the resulting picture would be truthful. This system has, I know, been suggested many years ago, and brought prominently into notice by Mr. Cowan, and I am given to understand that at least one American photographer adopts this method.

No one can have an adequate idea of the difference between two prints from the same negative unless he print one each on paper cut respectively crosswise and lengthwise, mount these wet in the way usually practised by photographers, and then compare them when dry. It is within my knowledge that portraits have been rejected from this cause alone, and such terms as *caricatures* have been applied.

Now for the remedy. I would urge upon photographers who mount wet as I do the practice of always cutting their paper lengthwise, as the expansion is then greater in its wet state in a lateral than in a vertical direction, which suits the average type of English faces. I need scarcely say that when the utmost accuracy is desired, it is important that the print should be dried previous to being mounted, and the mounting effected by starching the back, allowing to dry, and damping the mount.

ENLARGING OR REDUCING.

By G. M. Iliff.

I have found the following simple rule very useful in enlarging or reducing, but have never seen it given in any work on the subject.

To enlarge, multiply focal length of lens by *one* more than the number of times you wish to enlarge; this will give you distance from diaphragm of lens to focussing screen; divide the result by exact *number* of times required to enlarge: this will give distance of subject to be enlarged from lens diaphragm. For instance, with a lens eight and a half inch focus, to enlarge *three* times:—

$8\frac{1}{2} \times 4 = 34$, distance of screen from lens.
$34 \div 3 = 11\frac{1}{3}$,, subject ,,

To reduce, reverse distances of screen and subject from lens.

[The above rule has been published more than once in earlier volumes of this Almanac, but it will not suffer by repetition here.—Ed.]

MOUNTING WITHOUT COCKLING.

By J. J. Acworth, F.I.C., F.C.S.

When photographs have to be mounted in albums or in books, it is of the utmost importance that they should not cause any cockling of the boards or paper upon which they be mounted. To mount without cockling is, with a little practice, quite easy. It is of the first importance that as little water be used as possible. The prints must therefore always be mounted *dry*, and either quite flat or with the face side curling outwards. This is easily managed by rubbing the back of each photograph, placed face downwards on some soft material, say half a dozen folds of flannel upon a deal board, with the smoothed and carefully rounded edge of a piece of wood, about four to five inches long, about three inches wide, and a quarter of an inch or more thick, or a paper-knife would answer the purpose fairly well. The next point will be to place the photograph exactly where it is intended to be fixed, and then to make a mark at one corner, and again, once or twice, at some distance further along one of the edges. The print is then ready to be quickly brushed over with the mountant. I have had some experience with such, and find that many are good for the purpose, provided the solvent be kept within very close limits. I have succeeded with the following: bookbinders' glue with an addition of dextrine, and just sufficient water for comfortable working. 'Marion's Mountant' answers well, as also does a mixture of good light-coloured ordinary glue, with about a quarter its weight each of glycerine and sugar dissolved in about seven to eight times its weight of water; a small percentage of alcohol also improves this.

After being brushed over with the mountant—this is best done by placing the photograph on a clean glass slab, or upon a pile of papers cut sufficiently large to place the photograph upon, so that a fresh paper can be used each time, thus saving washing the glass—the print is gently placed down at the marked corner, then manipulated carefully so as to follow the guides and to avoid, if possible, taking up the print after being once fixed in position. By paying attention to the above, there need not be the least trace of cockling on boards, and merely the slightest when mounting on paper.

PAPER NEGATIVES.

By S. D. McKellen.

Having exposed five 15 × 12 Eastman paper negatives in my roller slide I was anxious to see what the results would be. The afternoon had been wet and dark, and the exposure had varied from 30 to 120 seconds with an $\frac{f}{60}$ stop with an old o. a. doublet, whilst the interior of a church had had nearly an hour of exposure.

I found on preparing to develope my five exposures that I had mislaid my formula—'Eastman's'—nor could I find any other formula. I could not wait till next day, so I decided to work with the ferrous-oxalate developer. This was prepared by adding two ounces of protosulphate of iron saturated solution to twelve ounces potass oxalate saturated solution, and about six drops of a thirty-grain solution of bromide potassium.

With this quantity of developer, and without any modification whatever, the whole five sheets came out fine, well exposed, and vigorous negatives.

Some required twice as long in the developer as others, but the ultimate result was that all were as nearly alike as possible and all printed well. I did not care about the trouble of squeegeeing, so I placed my negatives after washing in a tray of methylated spirit for fifteen minutes, and after they had been removed from that for a few minutes, and had become surface dry, I rolled them up each one separately with the gelatine side out. When dry they were as flat as need be. In my printing frame I use thick sheet glass, *not plate.*

Sheet glass is generally round on one side and hollow on the other. I put the sheet glass in my frame with the convex side next the negative; this secures good pressure in the middle of the negative, and there is enough elasticity in the glass to ensure the flatness of the whole if the printing frame springs are sufficiently strong. The latter is a very important point.

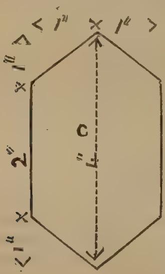
I never oil my paper negatives; it only necessitates a little longer exposure in the printing frame to print them as they are after drying, and it saves a lot of messy trouble. Besides convenience there is the greater permanence gained by omitting the oiling process.

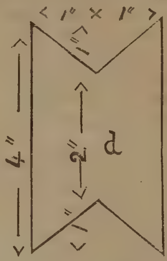
INSTANTANEOUS SHUTTERS.

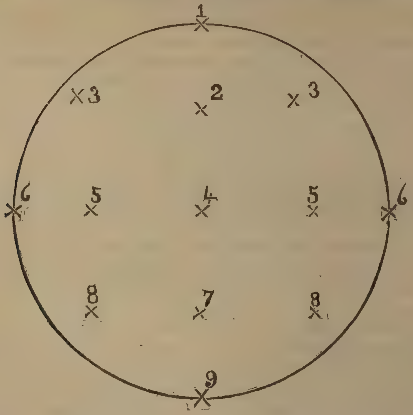
By Assam.

In most instantaneous shutters the amount of light admitted varies on different portions of the plate, and in some it varies much more than most persons think. In making these investigations I have, to save trouble, taken the opening behind the shutter as one of two inches diameter, and I have neglected friction.

The first I take is the ordinary drop shutter. The velocity of this varies from moment to moment, gradually increasing from a slow to a rapid pace, so that all parts of the aperture do not receive the same amount of light, and it makes a considerable difference whether the exposure commences immediately or at some time after the shutter has commenced falling, and it also varies with the shape of the opening of the shutter. I take the following openings: *a*, two inches square; *b*, four inches high by two broad; *c* and *d* as in sketches; and the time







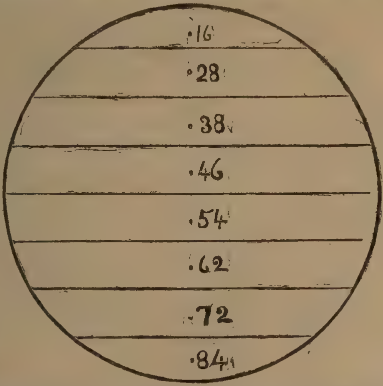
in seconds during which light is admitted through the points shown above is—

	1	2	3	4	5	6	7	8	9
a	·102	·063	·063	·053	·053	·053	·046	·046	·042
b	·144	·102	·102	·089	·089	·089	·089	·089	·074
c	·144	·102	·072	·089	·065	·047	·081	·059	·074
d	·063	·053	·084	·047	·072	·102	·042	·065	·039

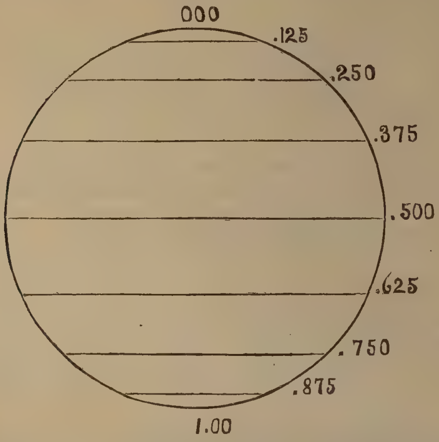
In *a*, *b*, *c*, the moment the shutter begins to fall the exposure commences; in *d* the shutter falls half an inch before the exposure commences at the top. If the shutter falls two inches before the exposure commences, then with the same openings the result will be—

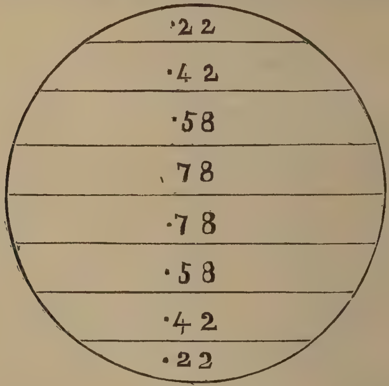
	1	2	3	4	5	6	7	8	9
a	·042	·039	·039	·036	·036	·036	·034	·034	·032
b	·074	·070	·070	·065	·065	·065	·062	·062	·059
c	·074	·070	·049	·065	·065	·046	·062	·044	·059
d	·044	·039	·059	·036	·036	·055	·034	·051	·032

From these two tables several things may be seen: first, the illumination is much more even if the shutter drops some distance before the exposure begins, even so small an amount of two inches; secondly, this even illumination is also obtained, but not to the same extent, by increasing the length of the opening; thirdly, in my opinion, any fancy-shaped opening will lead to unequal illumination over the aperture.



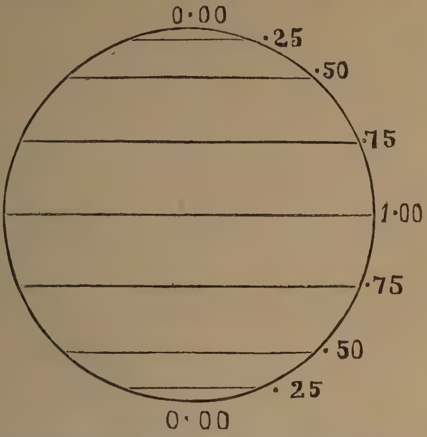
The second form of shutter is that which rises and falls in front or behind the aperture by means of a revolving wheel. The shutter may be single or double, and in the latter case the opening takes place from the centre. I take the former case first. The shutter being closed, then as the wheel revolves it rises, slowly at first, and then more rapidly, until it has completed a quarter revolution, when the rate of lifting decreases until a half revolution is complete, when it begins to descend. From this it is evident that the lower portion of the aperture receives much more light than the upper. I give two diagrams to show this, the maximum amount of light being unity. The first diagram shows the approximate average amount admitted to successive strips a quarter



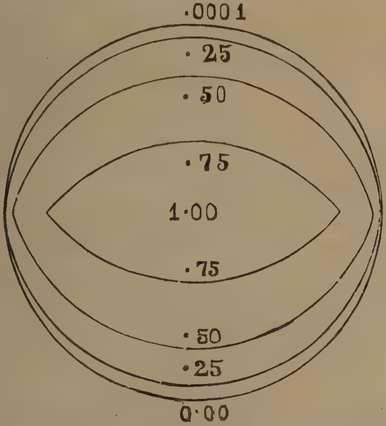


of an inch wide; and the other the positions of the lines in the aperture which receive $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, of the maximum amount of light.

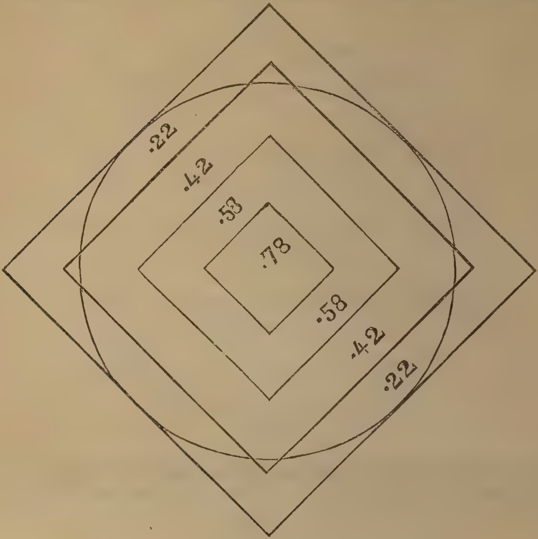
Third.—The double shutter acts by two shutters opening from the centre and closing again by the revolution of a wheel. Each half of the



opening then receives light at the same rate as the whole aperture did in the last case, and I give similar diagrams to the last. The openings



may be diamond-shaped or circular instead of square, and the exposure will be the same or any similar strip. If the shutter, instead of rising vertically in a groove, rotates like a flap, the amount of light will be the same in both cases. Another form is a flap which rises and then releases an ordinary drop shutter; this gives unequal illumination, as the exposure at the bottom of the aperture must be much longer than at the top.



To sum up. 1st.—No drop shutter can give equal illumination over the whole aperture, but if the opening be twice or three times the aperture, and the shutter drops a few inches before the exposure begins, the illumination will be practically uniform.

2nd.—No shutter which travels from one side of an aperture and then returns, first opening and then closing the aperture, can give equal illumination, whether the shutter moves at a uniform speed or no.

3rd.—The same applies to any shutter opening from and closing to the centre, but in this case if the rise and fall of the shutters is over a longer space than the aperture the irregularity of illumination will be lessened; still, even then, it will be more unequal than with an ordinary drop shutter.

4th.—The only form which will give equal illumination over all portions of the aperture is a shutter travelling at any speed uncovering the aperture from one side and followed by another shutter at any interval travelling in the same direction and at the same speed as the first closing the aperture.

Most pictures do not require the same amount of light to be admitted to every part, as the foreground usually requires more than the centre, and that more than the sky; but as the position and shape of these parts varies, it would be impossible to get a shutter to suit all subjects. By varying the speed of the shutters independently of one another, and their shape, some improvement might be made, but it would probably lead to complications. I think it would be better to have a shutter which gives an equal or nearly equal amount of light to every portion of the aperture, than one which gives a much larger amount to one portion than another. Friction has been entirely neglected in these investigations, but it would rather tend to increase than to decrease the irregularity.

I was led to make the above investigations from the following cause: Having a 10 × 8 camera, and working with three lenses which had often to be changed, it was much more convenient to have a shutter behind the lens than to adapt it to all three. A drop shutter behind the lens gave more exposure to the sky than to the foreground, and if it fell some inches before the exposure began it would be bulky, and there was not room for it to drop. No indiarubber would stand the tropical climate, and I could not find any shutter which would suit my requirements, which were:—

1st. To work behind the lenses.

2nd. Be fairly compact.

3rd. Admit an equal, or nearly equal, amount of light to every part of the plate.

4th. To work at a rapid or moderate speed at will and without vibration.

5th. To have no *indiarubber*.

6th. Constructed so as not easily to get out of order in a tropical climate with rough usage, and to be easily repaired.

7th and last, but not least. It must be moderate in price.

APPENDIX.

Table showing the time in seconds which a body takes to fall from rest to any point up to ten inches by tenths of an inch.

Inches.	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
0	0·000	0·023	0·036	0·044	0·046	0·051	0·056	0·060	0·064	0·068
1	0·072	0·075	0·079	0·082	0·085	0·088	0·091	0·094	0·096	0·099
2	0·102	0·104	0·107	0·109	0·111	0·114	0·116	0·118	0·120	0·122
3	0·125	0·127	0·129	0·130	0·133	0·135	0·137	0·138	0·140	0·142
4	0·144	0·146	0·147	0·149	0·151	0·153	0·154	0·156	0·158	0·159
5	0·161	0·162	0·164	0·165	0·167	0·169	0·170	0·172	0·173	0·175
6	0·176	0·178	0·179	0·181	0·182	0·184	0·185	0·186	0·188	0·189
7	0·190	0·192	0·193	0·194	0·196	0·197	0·199	0·200	0·201	0·202
8	0·203	0·205	0·206	0·207	0·208	0·210	0·211	0·212	0·214	0·215
9	0·216	0·217	0·218	0·219	0·220	0·222	0·223	0·224	0·225	0·226
10	0·227									

Table showing the distance in inches and decimals which a body falls starting from rest in any time from 0 *to* ·250 *of a second by* ·005 *of a second.*

Secs.	Ins.	Secs.	Ins.	Secs.	Ins.	Secs.	Ins.	Secs.	Ins.
·000	·0000	·050	0·479	·100	1·930	·150	4·344	·200	7·723
·005	·0048	·055	0·584	·105	2·129	·155	4·638	·205	8·303
·010	·0193	·060	0·695	·110	2·336	·160	4·943	·210	8·515
·015	·0434	·065	0·816	·115	2·553	·165	5·244	·215	8·925
·020	·0772	·070	0·946	·120	2·780	·170	5·558	·220	9·280
·025	·1207	·075	1·086	·125	3·017	·175	5·913	·225	9·775
·030	·1737	·080	1·235	·130	3·263	·180	6·255	·230	10·241
·035	·2365	·085	1·395	·135	3·519	·185	6·609	·235	10·663
·040	·3089	·090	1·563	·140	3·784	·190	6·970	·240	11·133
·045	·3910	·095	1·742	·145	4·059	·195	7·359	·245	11·590
								·250	12·067

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A PRINT-WASHING MACHINE.

By W. England.

Prints on albumenised paper still maintain their popularity with the general public, and will, I think, do so for some time to come. Many other printing processes have been introduced, some with every promise of permanency, and, no doubt, in some respects more artistic; still, when most people are shown examples of silver and other kinds of prints they invariably choose the former. This being so, and some years' experience has convinced me of the facts, it behoves every photographer to do his utmost to render albumenised prints as permanent as possible. This, I know, has been urged over and over again; still, too much importance cannot be given to this subject. Very careful washing of the prints is absolutely necessary, and for this purpose constant motion and plenty of changes of water will best conduce to permanency.

During my experience of over a quarter of a century I have used a washing apparatus which I have before described, but as the idea may be new to some of the present generation I will again describe it, although it is rather difficult without diagrams.

A trough about four feet by three feet, and, say, one foot deep; this may be made of wood pitched inside, but I prefer slate, which can be readily obtained at any slate works. Inside this trough fit a frame made of wood, about eight inches deep and a little smaller than the trough; this must be hung on centres to obtain a rocking motion, and the bottom covered with gutta-percha strips about half an inch wide, laid from end to end, and across so as to leave openings of about an inch; this will keep the prints from the bottom of the trough. A water-wheel, about fifteen inches diameter, which may be made of Willesden paper or zinc—the latter any plumber can make; this placed in a small cistern sufficiently large to receive it and fitted on the side of the trough, will, by being connected with a crank to the inner frame, give the necessary motion. A small stream of water will work it, and will, at the same time, wash the prints by being conducted into the washing tank. One feature, however, I must not forget to mention is that a syphon should be attached ; this will ensure the water being constantly changed, and by being placed below the bottom of the inner tray will, on each occasion of emptying the tank, drain the prints to enable them to again absorb the water. The whole of the arrangement is so self-acting that turning on the water supply is all that is necessary, and I am quite sure the prints are thoroughly washed.

I am told that a Glasgow firm has taken out a patent for a similar washing machine. If so, I feel assured it cannot be valid, as many photographers have had one of these machines fitted up since I first described it. I also claim to have originated the idea some six-and-twenty years ago, and put it into practice at that time.

DEVELOPMENT IN HOT CLIMATES.

By Col. Stuart Wortley.

It seems hardly worth while to write so short an article, were it not that an old friend (the Editor) asks me to do it. But as gelatine plates are now being so largely used all over the world it may be useful to point out a valuable help to those who have to work in very hot climates.

When in Tahiti six years ago I had to do much developing at a temperature of 95° and over in a developing tent, and I feel sure much of my success was due to my using the freezing salts of ammonia. I used them in the developer, and also by putting the developing dish into another one containing one of the freezing salts in solution.

I did not find that the heat of *climate* in any way affected the plates (of my own preparation as well as some others), but that the warmth of the developer, united with the heat of climate, *did* exercise a notable effect. Hence the desirability of cooling down developer and fixing solution.

SYSTEM OR NO SYSTEM.

By A. Cowan.

If 'constant dropping will wear away a stone,' perhaps constant agitation may eventually induce the photographic fraternity to adopt some recognised system of weights and measures when publishing new formulæ.

There have been, from time to time during the last few years, several attempts in this direction individually, but what is wanted is that those interested should strive collectively to come to some understanding as to which is the most desirable method. At present nothing is more vexing than to find, after a considerable time spent in reducing a new formula to working proportions, that it is perhaps nearly identical with one already familiar to the user.

It may be taken for granted that an experimenter, trying any new formula, wishes to intelligently comprehend the relative proportion of the various constituents, so that should occasion require he may be able easily to modify them according to his requirements, which under the present want of system is extremely difficult. It does not seem probable just now that the gramme and centimetre system in use on the Continent will be readily adopted in this country, but there surely is no valid reason why, if we cannot adopt that, we should not have one of our own, and, if possible, one easily interchangeable with the Continental. Amongst the many methods from time to time advocated, is that of expressing all the quantities in grains instead of ounces (of *two kinds*), drachms, scruples, minims, &c., and the use of the percentage system in making up solutions. This system seems to have found much favour, and it certainly has the merit of simplicity and convenience—nothing being easier than to have a series of ten-ounce bottles, each contaiaing one ounce of the various chemicals filled up with water, so that from any of these a given quantity required can be much more easily and accurately measured by taking ten times the number of grains required than can be done by separately weighing out each constituent. For this purpose there can be procured graduated grain measures of any capacity, from 100 to 10,000 grains, and any one once getting to use these will not easily be persuaded to abandon them. But it is possible, if a goodly number of those interested could be induced to strive together to settle the 'battle of the gauges,' some good, recognised standard system might be arrived at, not only with regard to weights and measures, but in many other branches of our science.

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CLOUDS IN NEGATIVES AND PRINTS.

By George Davison.

How few photographers really have good assortments of cloud negatives! How many vow each commencing season to supply their deficiency! Why so poor a crop of results from so frequent and earnest intentions? The fact seems to be that for the generality of us our chances in this direction are rare. It will not be disputed that it is difficult to obtain a view of the horizon in London and other large cities. To fire from attic windows, as some advise, is generally wasting plates. Zenith clouds and others of high altitudes can seldom be used without misplacement and shameful detection. A further fact is that really good and useful cloud effects are not so common as is generally supposed. When they do come, finding the camera ready, they are not secured, because of the enticement to use all the plates in our slides upon combinations, promising clouds, and landscape in one.

Having found a day of clouds in a meadow and marsh country, or at the sea, shall plates be exposed all round the horizon, panorama fashion, or can discretion be advantageously exercised? The usual advice is that the best results are obtained towards the sun, the sun included within the angle of vision of the lens, but hidden behind a cloud. Certainly this is the direction to look for thunder and lightning contrasts or moonlight effects. Those who give such advice overlook the necessity of having the clouds in a picture lighted from the same direction as the landscape. Good landscape photographs, even late in the day, when the light is weak, are rarely obtained towards the sun, and the wonderful cloud negatives are found to be white elephants. It is discovered that exhibition judges nowadays are becoming more and more critical and discerning. It is not everything to fill up blank spaces above our horizons with clouds of beautiful form or of striking contrasts. Truth, naturalness, and some suitability in composition must be sought for and secured in the picture.

Unfortunately the commonness of incorrectly lighted and unnaturally placed clouds is such as to justify repeated deprecation. The most frequent example to be seen, even in prints prepared by leading firms for exhibition (at ever so much per print) is the heavy cumulus half below the horizon.

As to the selection of cloud pictures on a suitable day few directions can be given. The camera should be placed so as to include the horizon upon the plate, and attention should be directed to avoiding such combinations of clouds as promise very little likelihood of fitting ordinary composition. Wonderful cloud negatives are frequently shown which could never by any possibility come of service. A useful form is to secure a sky in which the main line of direction of the clouding is diagonal.

With ordinary clouds away from the sun it may prove difficult to obtain contrast. The orthochromatic plates of Messrs. Dixon & Co. ought to prove useful here as rendering blue against white in their true relative shades of monochrome.

As regards the development of cloud negatives on ordinary plates a well-restrained developer, strong in pyro, should be used, and the development stopped whilst the negative is still thin. It will now be found whether one of the most necessary but most disregarded precautions has been taken when the plate was put into the slide, namely, whether the slide and plate were carefully brushed. This is specially important in preparing to photograph clouds if it be desired to avoid subsequent trouble.

As to printing clouds from negatives containing the effect buried in density, the feeling of the sky can frequently be obtained by masking the landscape part and giving the buried sky very long printing. Local reduction, again, is often resorted to successfully.

If the negative be thin and the sky prints too dark, as with most over-exposed plates, a very favourite plan is to retouch or paint the effect desired upon the negative. If the clouding be there, strengthening of the contrast and a slight masking with tissue-paper to keep back the printing are all that will be required.

If no cloud is in the sky of the negative it may be stumped or retouched upon the film side with a great command of effects, but the labour and skill needed will be considerable.

A generally successful plan for a simple cloud effect is to paint over the back of the negative with some wash of red colour—Gihon's opaque works well—using broad or fine brush and thick or dilute colour according to effect and density desired. By tilting the plate the paint which is still liquid can be made to flow into forms which give very natural clouding, having the appearance of being lighted from any required direction according to the way in which the paint is allowed to dry. If the first attempt does not prove satisfactory the brush can be passed over again to alter the forms, and a fresh attempt made. When all is dry stronger effects can be marked on the first wash where desired.

This dodge will be found useful at least for unimportant negatives. It works easily, has some points as a hint not previously suggested, and occasionally shows surprisingly natural results.

It would be opening too wide a question for these notes to ask whether this and kindred contrivances are legitimate photography.

ON THINGS IN GENERAL.

By Assam.

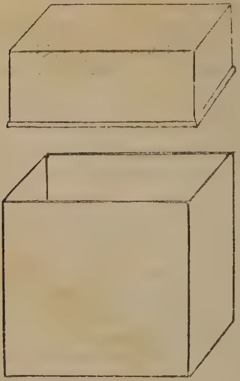
Ordinary dry plates ought to keep for an indefinite time in a *dry* climate, however hot or cold it may be; but they soon go bad if the climate be *damp* as well as hot unless packed better than most dry plates are. The plates I have seen have been packed in one of three ways inside the boxes.

1st. Close to one another, having only a piece of paper in contact with the sensitive surface between this and the next plate. The objection to this is that if the gelatine gets damp the paper, or dust from it, sticks to the surface and damages it.

☞ 2nd. The plates are in grooved boxes. This is most objectionable where they receive rough usage in transit, as dust is caused by their fraying the surface of the paper grooves, and this settles on the plate. If, also, by any accident, one plate is broken, it is almost certain that all the others will be broken or damaged.

3rd. The plates are separated from one another at the edges by thin strips of cardboard. This, I think, is the best method of the three.

The boxes are generally flimsy cardboard, not sufficiently strong to properly protect the plates, and they are far from damp proof. I would suggest that (for export and tropical climates at least) tin boxes, holding, say, two dozen, might be used of a form similar to the sketch. (Negative paper is now packed in boxes containing two dozen, and there is no reason why all but very large glass plates should not be so packed.) If the cap overlaps the box two or three inches, it will be practically light tight, and by gluing paper round the join it will resist almost any amount of damp. If the box be half an inch broader than the plate, it can be used for storing negatives in by putting in wooden grooving. Anyhow, it would be useful for many purposes, and most persons abroad would not object to 3*d*. or 6*d*. extra for the better box.



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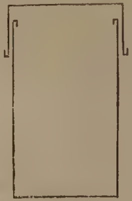


I would like to see the formulæ for developing pasted on *outside* the box, as well as enclosed, so that one could make up developers before starting on a journey or opening the boxes. Also that each maker would state distinctly the number of grains of each chemical to each ounce of water used in developing a properly exposed plate.

This is a minor matter compared to knowing the relative rapidity of different plates, as it very often happens abroad that we cannot get the plate we want, and have to use a strange plate. At present, most makers state that their plates are so many times as rapid as a wet plate; but if two plates by different makers supposed to be, say, thirty times, are tried, it will be found probably that they vary considerably in rapidity, and, therefore, when using a strange plate, we run a considerable risk of failure. Cannot the makers test each batch of plates by Warnerke's standard sensitometer, and mark each packet with its sensitometer number and its rapidity compared with a plate which registers No. 1. We could then know approximately the correct exposure for a strange plate.

I have come across several lenses by first-class makers whose focus did not agree with the equivalent focus given in the maker's catalogue. I have just tested a lens by one of the best makers, the equivalent focus of which is given in his list at eight and a half inches, whereas it is actually nine and three-quarter inches. Another, by the same maker, nominally the same focus, was actually about seven inches.

It would be very little trouble for the maker to engrave on the mount the equivalent focus of the lens, whereas at present, unless one actually tests it, there is no knowing what the actual focus is, and from the want of this a lot of unnecessary trouble may be caused. I would also like to see the U.S. number engraved on each stop (the maker may put anything he pleases on the other side). With this information, and the certainty of its correctness, it would be far easier to compare any two lenses than it is at present, and to judge what exposure to give to any plate with any stop.

I think most of these suggestions have been made before, but they do not seem to have been acted upon; and though they may seem trifling to one in England, they are by no means so when abroad and no one near to consult with.

REDUCING OVER-PRINTED PROOFS.

By W. E. Debenham.

Of the various plans which I have tried for lightening silver prints that have been printed a little too dark, the only one with which I have succeeded is a continued immersion in the hypo bath. With prints that have been somewhat, but not grossly, over printed I have found that if left in the hyposulphite solution for a period of from half an hour to two or three hours, according to the amount of reduction required, prints have resulted which could not be distinguished from those which had received the proper exposure in the printing press. The same bath as that in which the prints have been fixed may be used provided that it was a new one, or a fresh ten per cent. solution of hyposulphite may be mixed for the purpose; but a bath which has been used more than once and kept a day or so is apt to impart a greenish tone to the prints, and its influence upon their permanence may then be called in question.

ON THE IMPORTANCE OF A LIBERAL SUPPLY OF GOLD IN TONING.

By Valentine Blanchard.

The experience of every photographer is alike in confirming the opinion that photographic prints on albumenised paper were formerly more permanent than they are at present, and various theories have from time to time been brought forward to account for it. But the most reasonable of them all appears to be that of Mr. W. K. Burton, in which he insists upon a sufficient and proper deposit of gold. Some recent experiments are so confirmatory of his opinion that I proceed to give them for the benefit of all those interested in the question. I first strengthened up an old lime bath with a fresh supply of gold, and made besides a new lime bath with boiling water in the usual way, using six ounces of boiling water to the grain of gold, about a drachm of common whiting, and one drop of a saturated solution of chloride of lime. As soon as the solution had cooled down to a little below blood heat, I poured from the sediment into a toning dish. The old bath was in capital condition and was toning at a comfortable rate when I commenced the comparative experiments. Four prints were taken from the batch in hand and marked on the back for easy identification, and two were soaked in a strong solution of salt, and then washed in two or three changes of water; these were put into the new lime bath, and the other two washed in the ordinary way were placed in the old bath. By the time the prints were toned in the old bath those treated with salt in the new bath had scarcely changed colour. I took one of the prints from the old bath and toned the other a slaty grey. By this time the other prints had changed a little, but had not got beyond a reddish brown; in about ten minutes there was a suggestion of purple-brown. I carried the toning a little further, until the purple was a little more evident, but the brown tone still predominated. The four pictures were now fixed with the rest of the pictures and washed in the usual way. These four pictures were picked out and were then cut in half. One set were immersed in a bath composed of four drops of sulphide of ammonium to a pint of water. In a very short time there was a marked difference in the appearance of the prints. The one toned in the old bath to the usual purple-brown in a very short time put on the sickly hue only too well known on faded prints. The other toned to slate colour resisted for some time, but finally took the cheese colour in the high lights. The other two pieces, treated with salt and toned with difficulty in the new bath, became much greyer, but did not, even after a much longer immersion, assume the sickly appearance of the others. The other halves were now put into a solution of bichloride of mercury. After a time the print toned to the usual depth in the old bath sensibly grew lighter, and acquired the pink tint produced by mercury; the slate-toned print resisted much longer, and did not bleach to the same extent, and the warm tone imparted by the mercury very much improved its appearance. The two prints treated with salts and toned in the new bath put on a slight pink tint over the brown, but did not bleach at all, except at the edges, where, by keeping them for some time out of the solution, the toning had purposely not been carried so far.

Now for the moral to be drawn from these experiments. If gold could be entirely substituted for silver we should hear no more of faded prints;

this is clearly shown in the burning-in process, where gold and platinum are substituted for silver in the image. A collodion transparency is made and the film is detached from the glass, and in the toning operation with gold and platinum it is not enough to change the front of the film into purple, for the toning or substitution operation is not complete until this colour penetrates the entire film and is equally strong on the back as on the front. If this substitution of gold and platinum for silver is not thoroughly accomplished, and any silver is left in the film, the colour of the image on the enamel after the process of burning in at once betrays its presence, for instead of the beautiful purple-grey that should be there a disagreeable green tone at once betrays the presence of silver.

If we could only bring about this perfect substitution of gold for silver in the paper prints we should then be on the way to perfection, but unfortunately at present we cannot. There is no doubt that free silver plays an important part in the usual toning operations. Every one must have noticed with a new toning bath that the first prints immersed in it are difficult to tone, and it is only after a little time that toning begins in earnest. Why is this? I have no doubt that a certain amount of silver is necessary in the bath before it begins to work with freedom. Now in the old days a bath was made up for each batch of prints and thrown away after service, whereas now the almost universal practice is to employ the acetate bath and use it over and over again, strengthening up when necessary with fresh gold, and by this practice undoubtedly a much larger quantity of prints can be obtained with a given quantity of gold than by the old plan of a fresh bath every day; but I firmly believe this is at the expense of the permanency of the prints, and that if we employed lime, borax, or carbonate of soda, with the gold, and used the bath so made the moment it was in condition for work, and completely removed the free silver by salt, we should produce a more perfect deposit of gold, and though toning operations would be lengthened, unless a very liberal supply of gold were allowed, we should in the end be rewarded by much more permanent prints.

REMARKS ON ENLARGING, &c.

By Dr. Valentine Knaggs.

Of all the varied manipulations necessary for success in photography, none, perhaps, afford us so much pleasure and subsequent satisfaction as the process known as enlarging, for by its means specimens of our work of fully tenfold the dimensions of proofs obtained in direct contact with the negative may be easily secured, and, when executed on rough paper, bear great resemblance to sepia drawings, mezzotints, lithographs, or fine etchings, for which they are pretty generally mistaken, and they are therefore specially adapted, when suitably mounted and framed, for mural decorations.

During the year I have prepared a considerable number of enlargements from small negatives on Eastman's rough surface papers, with most satisfactory and uniform results, the necessary apparatus being exceedingly simple.

The process teaches us many useful lessons both in the field and studio, it developes taste in the selection of artistic subjects, and assists in concentrating our attention to the image on the ground-glass of the focussing screen, and in making us familiar with many details necessary to success, in order that we may eventually obtain enlarged pictures of merit.

For instance, we may toil to the summit of a tower to obtain a bird's-eye view of a town or surrounding country, and may even use a tilted camera for the sake of securing a curious and instructive perversion of perspective, or we may wait patiently for the moment when a suitable object or view makes its appearance, or for a storm or mist to rise on the mountains in order to expose the plate correctly. Or, again, it may be desirable to devote attention to the production of difficult and uncommon effects, such as would partake of some originality and at the same time possess the attributes of a good picture.

It may be desirable, also, when opportunity occurs, to obtain cloud effects in the negatives, as the printing in of clouds to negatives is by no means easy.

Such subjects, then, would in every way be suited for the purpose of enlargements, which—I do not hesitate to say—will successfully compete with other branches of Art, and therefore ought to refute completely the contention that photography is a mere mechanical process, the effects of which are produced by a few chemicals and a flash of light.

I will now proceed to consider the working of the process. I always use a quarter-plate camera and, from the small negatives thus obtained, subsequently enlarge up to the size required. A light camera possesses many advantages. It enables us to carry our apparatus with a minimum of fatigue when on a trip. With a heavy camera we must either employ others to carry our goods for us or else submit to unnecessary exertions, and thus spoil our enjoyment. The initial expense both of apparatus and materials is very light, and even the entire outfit takes up but little space, the small negatives are easily stored, and much less liable to breakage than larger ones would be, while lantern slides and transparencies can be prepared from them with great facility, and without any reduction, as would be the case with negatives of greater size. The quarter-plate negatives can be easily and efficiently enlarged up to 12 × 10—a very convenient size—and even up to much larger dimensions, the extreme sharpness of the direct print being advantageously removed.

The character of the negative requires consideration. Great crispness to the edges is very essential to good work, and this is best secured by well stopping down the lens during exposure, but instantaneous views, taken with full aperture, will give equally good results provided the lens used covers the plate sufficiently.

It has sometimes occurred to me that a stand which is not too firm answers admirably for some instantaneous views, the slight vibration occurring at the descent of the shutter tending to dim the excessive sharpness of outline. Sargeant's shutter would cause a vibration in a vertical direction, which I consider best, and any stand can be manipulated for the purpose by slightly loosening the screw by which the camera is attached to it.

Excessive density or chalkiness in the negative is certainly a bad fault, and one which, in my opinion, is far less remediable than want of density.

I find that full exposure and a weak developer as a rule gives the best results, for by such means a negative is obtained which is not too dense, but is, at the same time, full of detail.

A well restrained ferrous-oxalate developer answers admirably when the exposure has been correctly timed or the contrast is not too marked, otherwise the pyro developer should be used, which undoubtedly gives a greater range of half tone, and allows of more latitude in exposure. By the latter method, and assuming that the plate has been given a very full exposure, I use the pyro in half and even quarter strength, and proportionately increase the quantity of ammonio-bromide solution, allowing plenty of time for detail to appear, the density being at the same time kept under. All negatives ought to be cleared after fixing, and the greatest care must be taken to avoid staining. The latter considerably detracts from the brilliancy of the finished print, and greatly increases the time necessary for the exposure of the paper.

Halation is invariably exaggerated in enlargements, and may be obviated by the well-known method of rubbing the film with a piece of wash-leather, moistened with methylated or rectified spirit, until the fogged portions of the plate are sufficiently reduced; dirt or gritty particles must obviously be carefully avoided during the operation, otherwise scratches will occur. Care is especially needed in negatives developed with ferrous oxalate, where the presence of a slight deposit of oxalate of lime will readily cause such marks. It is necessary to rub with some amount of force, and often for a considerable time, to secure the desired effect, but I have found the results thus obtained most successful.

A weak solution of chloride of lime has also been used for reducing halation and excessive density, as well as to remove stains. When the plate becomes soapy, the dense portions should be rubbed with the ball of the finger and then washed, the operation being continually repeated until the density, whether it be of a local or general character, is sufficiently reduced. Powdered chloride of lime effectually removes pyro stains from the fingers.

As a rule a plate, which is thickly coated, answers best for the small negatives, for halation will then but rarely cause any great amount of trouble.

I desire to direct the attention of my readers to so-called 'mist effects,' which, from their being uncommon, are most effective as enlargements. As I have lately devoted some consideration to such productions, I will endeavour to relate the method which I have adopted. At the same time it must be remembered that success is very uncertain, owing to the difficulty of judging the actinic power of a somewhat feeble light.

1. Select a suitable subject. A picturesque town, with a mountain or hill in the distance, would answer admirably, and a careful study of such pictures as those of Turner is also advisable, in order to secure similar results in black and white.

2. Use a thin plate, such as an Ilford ordinary, in order that the full effects of halation may be secured.

3. Work only in a feeble light, very early in the morning before the sun has risen, or late in the afternoon or evening when the sun is down. By these means the upper or sky portions of the negative becomes denser in proportion to the lower or ground parts, owing to the reflected light from the surrounding objects being more feeble than that coming from the sky. Let us bear in mind, also, that if, by making exposures at a time when

most persons would consider us to be wasting our plates, we should be mistaken either for lunatics or very inexperienced amateurs, we can afford to laugh at such mistakes.

4. As a rule, the clearer the atmosphere at the time of exposure the better the result.

I need not detain my readers with any detailed description of the apparatus necessary for enlarging. Suffice it to say that I have invariably worked by the daylight process, and for this purpose employ a rough 12 × 10 camera with a cloth bellows. Any one with a slight knowledge of carpentry can put together such an apparatus, which should be made in every way perfectly light tight.

By making our enlargements in this manner a considerable saving of time will be effected, as a film carrier of the proper size can be used for holding the paper. This carrier, which enables the paper to lie perfectly flat, is inserted into the dark slide, the exposure is then made, and after the exposed paper has been removed for development everything is again ready for use. The chief point about the exposure of the paper is to make use of the stops freely; generally a larger stop will be required in winter than in summer. Thin, weak negatives require the use of small stops, and almost any desired effect can be produced by judiciously working the stops. Using Eastman's paper for enlarging a quarter-plate negative of average density, up to 12 × 10 with an $\frac{f}{22}$ stop, in summer time I should give an exposure of about ten minutes. My favourite developer for the paper consists of five parts of the saturated solution of oxalate of potash to one of the iron solution, to which is added an equal volume of water. This flows more readily over the paper than the concentrated form. As a rule no bromide need be added. The acetic acid clearing solution I use of double the strength of Eastman's formula, as the iron is then more speedily washed out of the paper with two washings. Do not forget to occasionally hold up the paper during these manipulations, otherwise the acidulated liquid does not get beneath it, and consequently the paper will become stained when fixed and dried.

A few words might be added about transparencies. Always keep the old oxalate of iron solution which has been used to develope the paper. It makes a capital developer for chloride plates, and will usually retain for some days sufficient activity for the purpose. It affords great latitude in exposure, and gives sepia and brown tones, and of course the less active the solution the lighter will be the tone. When sufficient density is obtained I use the acetic acid clearing solution—forty drops to the half pint. This effectually removes the iron and prevents staining. The necessity of using distilled water is thus obviated, which I consider to be a great advantage. After fixing, a final dip into a solution of one part of dilute sulphuric acid to four of water will remove the slight deposit of oxalate of lime, and at the same time will partly restore the colour.

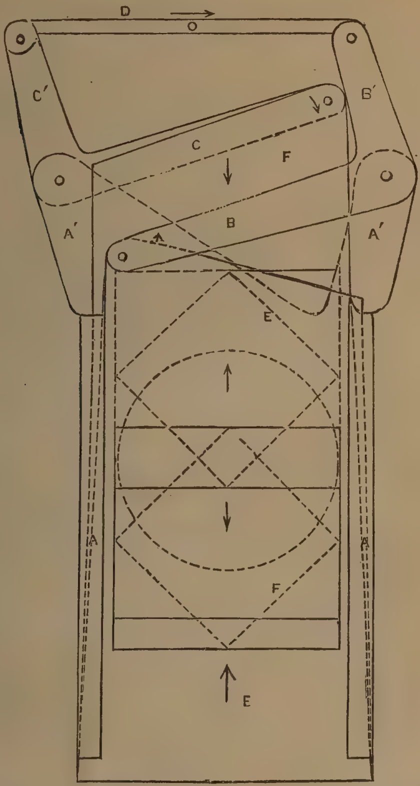
In conclusion, let brother amateurs ponder these suggestions, and should they be tempted by what I have written to try the process I feel sure much pleasure is in store for them. They will find no obstacles which may not be easily surmounted, and when they see the results they will be apt to exclaim with our old friend, Pope,—

'And all who told it, added something new;
And all who heard it, made enlargements too.'

A NEW SHUTTER.

By J. A. Harrison.

The accompanying sketch and description represents a new shutter of the Noton type, that is, two thin blades with square holes at an angle of 45° to pass over each other if to work between the lenses, but square with blades if to work at back or front of lens.



A′ A′ A A is of thin brass or other metal, turned over at the sides, A A, to form a groove for the blades to work in B′ B, and C′ C are two cranked levers connected by the rod D. The blades, E E F F, may be of thin metal or ebonite, E to be connected at left-hand corner to B, and F at right hand to C. The blades must be the width of the grooves formed at

A A at bottom, but narrowed at top to allow for the curves formed by the levers. It will be seen that if the rod D is moved in the direction of the arrow, that the long end of B and C, also the blades E and F, must also move as the arrows indicate. I have drawn it partly open, as I thought it would be clearer that way.

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FERROUS SULPHATE.

By A. Treyer Evans.

What is more pleasing to the eye than a ferrous oxalate developed negative, full of pluck and vigour? No developer yet introduced can approach it in its uniformity, cleanliness, and colour of the silver particles reduced by it; but when not freshly and properly prepared it is inclined to flag towards the end of development, and we find that a thin negative, without any variation in density, is frequently the result.

The poor amateur puts this flatness of image down to the want of sufficient light in illuminating the object, when, by a careful study of photographic chemistry, all these wrongly attributed defects may be overcome by an entirely different procedure than that under which the tyro had been previously labouring in vain. Those who are chemists know the characteristic instability of the ferrous salts, and how biased they are to oxidation and conversion to the corresponding ferric state.

To obtain pure ferrous sulphate from an ordinary chemist's shop would be the next thing to a miracle, as the purest commercial sample on solution with water gives a blood-red coloration with thiocyanate of ammonia indicating the presence of ferric sulphate. The reader may trace, in the equation here formulated, how ferric sulphate becomes converted into the corresponding oxalate by its addition to potassium oxalate when compounding the ferrous oxalate developer.

$$\underset{\text{Ferric Sulphate.}}{Fe_2\,(SO_4)_3} + \underset{\text{Potash Oxalate.}}{3\,K_2\,C_2\,O_4} = \underset{\text{Potash Sulphate.}}{3\,K_2\,SO_4} + \underset{\text{Ferric Oxalate.}}{Fe_2\,(C_2\,O_4)_3}.$$

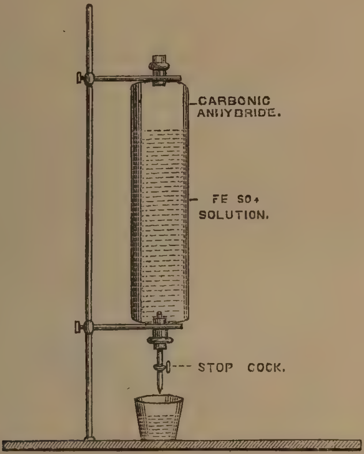
Obtain the largest crystals of ferrous sulphate and rinse them with cold water until they cease to impart a yellow colour; indeed, I have frequently washed a pound to three-quarters, and occasionally to half a pound, by this means, to get the 'heart' of the crystal, where air has not yet contaminated its virgin purity.

To preserve ferrous sulphate in solution several methods have been adopted, all of which have their ill effects.

If we prepare the iron solution and fill one-ounce bottles with it, and lute their corks with paraffine wax, it occasions a deal of unnecessary time and labour, because when a bottle has once been opened, air fills the space formerly occupied by the solution and oxidises the remaining liquid. Another and most common *modus operandi* is effected, though imperfectly, by keeping the solution from contact with the atmosphere under a layer of castor oil.

Now, oil or grease of any kind does not improve a developer, as when the iron sulphate solution is drawn from beneath it, it very frequently brings over with it small, floating globules of the oil, especially when the solution is low in the containing bottle. I may here note that the same bottle cannot be used again, as its sides are covered with an emulsion of oxide of iron and castor oil, and wash as you will you cannot remove this abominable filth. The method I am about to describe has, perhaps, been used by photographers before, therefore I claim no monopoly; but the bottle of storage may be of some value to those who develope by this iron method.

Obtain from a philosophical instrument maker a bottle having two necks, one at either end, the lower one fitted with an indiarubber stopper carrying a glass stopcock, arranged upon a retort stand as in the following diagram. Through the uppermost neck introduce the ferrous sulphate solution, previously acidified with strong sulphuric acid. Pass powdered potassium carbonate through the neck by means of a glass funnel (the relative proportions of sulphuric acid and potassium carbonate are 98 and 138·2 respectively, in other words, 98 parts of sulphuric acid are required to neutralise 138·2 of potassium carbonate). Sufficient of these must be added to evolve enough of carbonic anhydride to displace the air contained in the bottle; this is caused by reason of the greater specific gravity of the carbonic anhydride. A coin should be placed on the mouth of the bottle and the whole left undisturbed until all effervescence has subsided, then replace the coin by a cork. The iron solution is now cut off from contact with the atmosphere by the heavy gas floating upon its surface. The reaction that ensues is this: We take acidulated iron sulphate and carbonate of potash, and we get sulphate of potash in solution and carbonic anhydride liberated, which gravitates supernatant to the iron solution, and invisibly protects it from oxidation.



No comment need be made upon this mode of storage, or respecting further detail as to its application, but I may add that I have a sample of ferrous sulphate preserved by this method for the last six months, and the pale green colour is still persistent without the least sedementary deposit. I have noticed that the iron solution turns yellow when kept under castor oil, and contains a considerable amount of ferric sulphate. I earnestly believe that the slightest trace of a ferric salt in a developer is detrimental to its good working properties, for it causes a marked dissipation of its specific energy and indubiously attacks the finer particles of metallic silver all over the film, causing a decrease in contrast, and, finally, a more sunken-in picture is the result. This may be proved by using a spent sample of ferrous-oxalate developer upon a correctly exposed dry plate, when the resulting picture will most assuredly turn out a flat, ill-defined, and rejectable negative.

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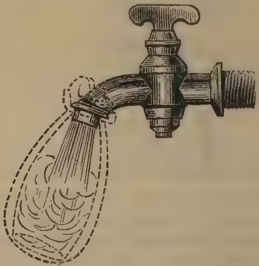
WASHING GELATINE EMULSION.

By Chas. A. Parker.

The description of a simple and efficient means of washing emulsion, which the writer has always adopted with perfect success, may prove acceptable to the plate-making readers of the Almanac.

Many different methods have been recommended for washing emulsion, but I think that the simplest and most efficient is the one illustrated in the accompanying diagram, the description of which is as follows. The only articles required will be an ordinary lamp-glass (comet pattern, price 2*d.*) and, likewise, a supply of book muslin.



The emulsion being ready for washing, break it up into small pieces; collect these and put them in the centre of a large square of Berlin-work canvas, which has previously been wrung out in clean water; then gather the ends of this together and proceed to squeeze and twist the emulsion through the meshes of the canvas—this will have the effect of breaking it up into very fine shreds. Now collect all these and place them in the lamp chimney, keeping them in by holding the hand over the small end; then place two thicknesses of the book muslin over the large end, draw them together tight and then turn it up and proceed to tie the other end over the rim of a tap, from which it will remain suspended. Turn on the tap in order that a steady stream may be constantly flowing through the glass.

By adopting this plan, all the soluble salts will certainly be removed in less than an hour, the emulsion being kept in a constant state of agitation all the time by reason of the current of water passing right through it with more or less force, according to the regulation of the tap. The tap entering the top of the glass will prevent any spluttering of the water outside. The dotted lines in the cut indicate the position of the lamp chimney and canvas.

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HOW AN ORDER WAS QUICKLY EXECUTED.

By E. G. Rivers.

One day last summer I was spending a few hours at the seaside, and enjoying a quiet gossip with a professional photographic friend, when a carriage was driven up to the door. A lady and gentleman were ushered in. "Can you take a group of us immediately?" asked the gentleman. The response was in the affirmative. The sitting was effected, the plate developed, and the negative pronounced good. "Now finish it immediately, and send down six prints to me at the 'Parade' Hotel within an hour at the very latest, as we leave the country at that time." This rather startled my friend, who was accustomed to have at least a few days in which to supply the orders of his customers. Remonstrance was in vain; it *had* to be done, was the reply, and the party left. Mr. —— looked glum at first, but he was equal to the occasion. Remarking to me that he did not read The British Journal of Photography for nothing, he hastily rinsed the negative (there was no time for thorough washing), placed it in a dish, poured some methylated spirit over it, and in five minutes it was dry. A packet of bromised paper, which he had obtained for experimenting with, was unwrapped, an exposure was made to the gas flame, and the developer having in the meantime been compounded, according to the printed directions, by the assistant, a beautiful print like an engraving was the result. The other five were produced in quick succession, and in a time that appeared to me incredibly short the order was completed. Warm solutions aided by alcohol for drying did the business.

When delivered they were not quite dry, and my friend impressed upon his client the fact that, as the washing had been incomplete, he would not be responsible for their permanence. But that, it seems, was of no consequence to the parties who sat, and who expressed their entire satisfaction with the result, and, what is also of consequence, paid liberally for the accommodation.

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ORTHOCHROMATIC PHOTOGRAPHY SIMPLIFIED.

By Robert S. Buchanan (New York).

Now that orthochromatic (or isochromatic) photography is on the tapis it may be well that devotees of the art should know that wondrously successful results may often be obtained on the ordinary commercial dry plates without the necessity being experienced of applying any aniline preparation or other dye stuff to them at all.

What is necessary in order to produce the desired result is merely to cap the lens with a piece of pale yellow glass. But as I experienced so much difficulty in obtaining glass suitable for the purpose, I had eventually to make some for myself; and having brought the matter down to the extreme of simplicity, I purpose describing the means I employed.

Obtain or make a thin, plain collodion, one rather thinner than would suffice for forming a negative film by the wet process, and one in which the proportion of ether much exceeds that of alcohol. Let it be quite clear in the lens of being free from undissolved fibres of cotton. Now add to it a little alcoholic solution of turmeric in, say, the proportion of a salt-spoonful to two ounces of alcohol, shaken up well, and allowed to subside, the clear supernatant solution (now of a fine yellow colour) only being decanted. Next, obtain a small plate of worked glass, or at any rate glass entirely free from defects, and of dimensions a little smaller than the cap of the lens, and coat it with the coloured collodion, by which it will be stained to a delicate yellow colour. Cut a hole in the lens cap and insert this glass. Now photograph the coloured object through this cap, giving an extra long exposure, of course, and the end will be attained.

A PROCESS OF THE PAST.

By Geo. Dawson, M.A., Ph.D.

I daresay some of my older readers may recollect the time when the negative process with waxed paper was the only convenient, or even possible, one by which tourists could preserve photo-pictorial mementoes of the scenery through which they had passed, but I can hardly add, and of the people they had met. The greatest drawback to the more general employment of this, in many respects, convenient process, arose from the extreme slowness with which the impression was made in the camera. This fact alone more than counterbalanced its other advantages of great portability, good keeping qualities of the paper both before and after exposure, entire freedom from optical halation, easy development, &c. Indeed, except for some special purposes, such as the automatic registration of some kinds of meteorological phenomena, waxed-paper photography may be considered as a thing of the past. And even for such uses, it must now, I apprehend, be supplanted by the more sensitive medium gelatino-bromide paper. Nevertheless, as I still retain a lingering affection for my first photographic love, and as some of your readers may wish to try a few experiments, I shall briefly describe the *modus operandi*.

Select thin photographic paper of the evenest texture and cut it to the sizes required. To wax expeditiously, say, twenty of these pieces, float, separately and for an instant, five of them on bleached beeswax melted on the surface of hot water. Then, within a folio of two sheets of thick blotting-paper, lay two unwaxed sheets, on these one which had been floated on the wax. Repeat this till the whole forms a pile. Close the folio, the two thicknesses of blotting-paper being outside. Then rub briskly with a hot laundry iron on both sides till the wax has entirely permeated all the sheets. All superfluous wax is taken up by finishing each piece separately between folds of fresh blotting-paper.

To iodise the paper, make up the following solution :—

Iodide of potassium	300 grains.
Bromide ,, ...	50 ,,
Distilled water	20 ounces.

Instead of water, fresh whey may be used with advantage. While the waxed sheets are soaking in this solution, for at least an hour, they should occasionally be turned over and separated, so as to avoid air-bubbles and to promote even iodising.

When dry they are ready, at any time, for sensitising in a bath composed of:—

Silver nitrate	600 grains.
Water distilled	20 ounces.
Glacial acetic acid	6 to 8 drachms.

The sensitiser is poured into a flat glass or porcelain dish and as many sheets as may be required are immersed, one by one, bubbles being removed with a brush or glass rod. The sheets should be turned over and separated occasionally to ensure even sensitising. This may be done either with a glass clip or non-metallic forceps. After soaking for about ten minutes, the sensitised sheets, after draining, are washed in three or four changes of water and then pressed between sheets of clean blotting-paper. Afterwards they may be stored away in a dry place till required for use.

In the olden time, double dark slides fitted with two squares of glass were generally used for the exposures, the sensitive sheets being placed on these, and a pad of cloth or paper interposed, serving to press them in contact with the glass when the frame was closed. I believe Mr. Melhuish, of Blackheath, subsequently made an improvement on this plan by an arrangement of rollers, something similar to the plan now adopted for exposing gelatino-bromide paper.

The development of waxed-paper negatives was an easy affair, as half a dozen or more could be developed at the same time and in the same solution just as easily as one.

The developer was made as follows:—

Saturated solution of gallic acid	10 ounces.
Acetic acid	1 ounce.

The exposed papers were first soaked in this for two or three minutes, then a few drops of silver nitrate were added while the sheets were occasionally moved about till the development was finished, usually in from ten to thirty minutes. The pictures were then fixed in hypo, thoroughly washed, dried, and, to render them more translucent, the wax remelted before the fire or by being pressed with a hot laundry iron.

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RESPECTING THE MARKING OF LANTERN SLIDES.

By Edwin Cocking.

Having had very many transparencies pass through my hands in order to tabulate them for exhibition in the optical lantern, I have felt the necessity of some system which should be accepted by all slide makers as absolutely necessary for the better working of these most popular exhibitions, and which I think would tend in no small degree not only to save much time, but also to dissipate considerable worry and vexation of spirit.

In the first place, there appears to be too much attention given to treating the slide as if it was something to be looked at and considered outside the lantern, and which is then seen with the picture in its proper position, and then, whilst so placed, if any information is written or printed it is usually attached to the top or sky portion of the picture; the slide then has to be turned upside down to go into the lantern, and the writing is then topsy-turvy. Again, when there is no writing at all, and the component parts of the picture are not decided in contour, from want of some absolute guide the lantern manipulator has turned the slide over and over before the right position could be decided upon. Then there arise various ways of notifying the name of the producer; with one it is at the right top corner, with another it is on the left, and, again, there is the title, which makes its appearance sometimes at the top, sometimes in all four corners (when the mask will allow space enough). There are many other ways (without mentioning those cases where not a single mark of any description appears) in which all the various necessary matters are put upon the slides, the result being simply bewildering to one who comes upon them for the first time—aye, and it may be said, at any time.

It appears to me that the very first consideration to be attended to should be some system agreed upon, which for all slides should at once determine and indicate the way they should be put into the lantern. Now this can be most easily done by placing a white piece of paper (whether square, oval, or round it matters not) on the right top corner of the slide, and to appear there at the very moment the slide is inserted in the carrier of the lantern. To arrange this systematically it is only necessary that the slide should be laid on the table, with that face uppermost which is to go next the condenser, and with the sky (or top) at the bottom and the foreground at the top—in other words, the slide laying upside down. When in this position, which is the way it goes into the lantern, attach a piece of white paper on the top right corner, on which should be marked in very plain and *easily read* figures, a number, and this should go on consecutively from No. 1 for each maker's slides, and if a slide afterwards may be thought unworthy to be shown, or possibly get lost, that number on any particular slide becomes also for ever unworthy or lost. Again, whilst the slide still lays in this position on the table, the top left corner may have, on a similar piece of white paper attached, the name of the producer, most distinctly written and very easy to be read, and then on the black paper which appears on the glass between the number and the name; and to this paper, at a fixed distance from the edge (with sufficient width), may be attached either printed or written (but most plain) titles, so that either when arranging the slides preparatory for exhibition, or at the actual moment of placing them in the lantern, it should be distinctly understood and accepted that whilst the slide is so held all the information upon it can be seen and read, and then no more thought is necessary to be given to it, and in that position every slide is quite ready to go into the lantern and be projected on to the screen.

I think something of this kind ought to be fully discussed and laid down as rules for all makers of lantern transparencies to accept and abide by. One great importance of the numbers running consecutively would be that it will enable the maker to keep a better record of them, and would be found most valuable when a selection is wanted, as then from the given numbers could be written down on the schedule used by the speaker the subject or title belonging to that number; but it must also be accepted that *distinctness* be the ultimatum—the eye at one glance should take in both the *name* of the *producer*, and also the *number*. Rules embodying some such suggestions as I have made would simplify the labours of those who have to tabulate slides when arranging public exhibitions. The popularity of photographic transparencies has grown exceedingly of late years, and coupled with this fact has been the evident desire for short descriptions of scenes; but this may be left for the moment, whilst attention is given to the initiatory matter of making some rules to be strictly observed by all who produce these beautiful slides, which reveal still further beauties when enlarged on the screen.

SILVER INTENSIFICATION OF NEGATIVES.

By John Birtles.

Amongst the various methods of intensifying negatives by means of a solution of bichloride of mercury, followed by other applications, I don't think that photographers realise in a sufficiently prominent manner the value of silver as a means of imparting density; at any rate, one hears very little about it now. There are many plates which do not require intensification at all, but, on the other hand, from under exposure or otherwise, there are many excellent and highly sensitive plates which will not develope up to strength sufficient to print well, without resorting to some subsequent means of intensification.

In the former times, when wet collodion was practised, it was the rule, and not the exception, that the details of a negative were brought out by an iron developer, and that these details were then brought up to printing density by pyrogallic acid and silver.

I would put in a plea for a return to this old system, which when applied to gelatine negatives gives intensity and fine quality. Silver intensification, moreover, gives a result which may be relied upon as permanent, which is more than can be said of any of the mercurial methods unless the utmost punctiliousness be observed in every portion of the process. There is only one point at which a failure is possible, and that arises from applying the intensifier before the fixing solution has been sufficiently washed out. After fixing wash the plate thoroughly and then immerse in an alum bath. Rinse well under the tap and apply a mixture of two grains of citric acid and three grains pyrogallic acid to the ounce of water. After allowing this to soak in for a minute, pour it off into a measure in which two or three drops of a twenty-grain solution of nitrate of silver have been placed, and pour this over the surface of the negative. This will impart the required intensity.

LANTERN TRANSPARENCIES WITHOUT A CAMERA.

By J. Hay Taylor (Florida).

I once had recommended to me a method of making tracings on glass which was very convenient for preparing lantern slides, and in the belief that it will be useful to many I here give a brief account of it.

Let us suppose that one is perusing a book illustrated by engravings (although this also applies to photographs), and that he feels a desire to have one or more of them copied in the form of a lantern transparency without having the means at hand for doing so by photography. The first thing to do is to select a clean and perfect plate of glass the size of the desired transparency, and to the surface on which the tracing is to be made apply the tongue, taking care that every part of the surface is moistened. This will dry in course of a minute without leaving any stain. The object of this is to make it take the ink at a subsequent stage without blotting. Varnishes and preparations of ox-gall have been recommended for a similar purpose, but this is the simplest and best. Now lay the glass down, prepared side up, upon the engraving or photograph that is to be copied; and by spring clips, a slip of gummed paper, or other means, arrange so that it shall not shift its position. Into a small bottle of common writing ink dissolve a lump of sugar the size of a pea, and with a steel pen having an exceptionally sharp point trace in fine lines the salient features of the picture. Owing to the previous treatment of the glass the ink takes to it with great readiness and without spreading. While making the tracing the eye should be kept, as near as possible, at a definite fixed spot, so as to ensure accuracy.

When the drawing is done it will be found to be so faint when looked through as at first sight to be worthless, but the greatest vigour may be imparted to all or any desired portion of it by rubbing it firmly with a tuft of cotton wadding charged with fine dry lampblack. In this way perfect opacity is imparted to the lines traced. The small quantity of sugar added to the ink ensures the adhesion of the black powder. By discrimination when applying the black any unimportant portions may be left quite faint; and thus by contrast greater force is imparted to parts desired to be displayed with increased prominence.

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PHOTOGRAPHY IN ITALY.

By Albert Levy (Paris).

In Italy the showcases of photographers are in a most untaken-care-of state, but I would, however, pick out the town of Pisa as certainly the one that should 'take the cake.' In many show windows in Pisa any one can see views of such a deep orange-yellow that they might replace any yellow glass to work collodion plates with, and also perhaps gelatine plates if used double. If this does not operate to deter any one from buying *cheap* Italian photographs I do not know what can. I am altogether against cheap photographs, as I know that below a certain decent price good and durable views are impossible. Now in this blessed country, where everything is expensive and very poor at that, how can any one of common-sense expect anything good that is very cheap? I am, however, glad to hear that business in photographic views is getting poor around Italy, and I hope it is only a consequence of results or experience from former tourists who have warned their friends from getting cheap Italian views. This will be one good result of this cut-throat business in the photographic views line, where quality is entirely swallowed up for cheapness.

Besides, Italian photographs, looked at artistically, are not good at all, but mainly black and white pictures, giving mere outlines, and not details; nothing in the shadows, and no softness of any kind. Portraits also are not very fine, specially as compared with the best, or even middle best work, as done in Paris, London, New York, or Vienna. In Florence, as to taste, I saw in one large frame twenty-four pictures, about 9 × 11, six of them in *dégradé*, or bust, and of the eighteen others, eleven in three rows of the very same background and same position, and five others of another.

Speaking now of the thousands of cameras sold everywhere I would ask, where are they? I thought that at least I would meet a few in Italy, where so many objects and chances are given to take views, as well instantaneous as otherwise. I only met one forlorn old gent in Rome in the same hotel I was in going up the stairs with a tired step, a small bundle, and a tripod; except that nothing, nothing whatever. Shall I take as an explanation the unwillingness of an unaccustomed amateur to show himself on the street to the passers-by, to the boys, &c.? This may in some cases be true, as it is sometimes very trying, especially in some places, like Florence for instance, to have a crowd around you, and particularly in front. How provoking it sometimes is when boys, and even men, and sometimes ladies, are looking such provoking, inquisitive looks in your bag when you take out the holder, into the camera when you remove ground-glass or holder, *under* your camera when it is covered with the cloth for focussing, and how they all rush to the front when you uncap your lens! One may be as cool as a cucumber; it is nevertheless awfully trying, and one thing I think few ever get fully accustomed to.

One improvement I am pleased to be able to state is the fact that dry plates are beginning to be generally known among railroad officials and custom-house officers, so that it is an easy matter to pass them without opening if not without paying. I remember the time, and that not very long ago, when this was a most serious matter, only overcome by lengthy, very lengthy conversations and explanations.

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A METHOD OF ESTIMATING THE VALUE OF PHOTOGRAPHIC WASTE.

By Nemo.

In the winter it is the practice of most photographers to collect together the residues that have accumulated during the year and send to the refiners, and a ready, and, at the same time, sufficiently accurate method of estimating the value at home will no doubt be of service.

Photographers sometimes complain that they do not get enough for their residues, and no doubt they are often justified in so doing, for on two occasions I have received an extra allowance on my complaining to the refiners.

For the method that I am about to describe it is necessary that the residues are most intimately mixed and passed through a gauze sieve, mesh about twelve to the inch. It is better to keep the sulphides apart and treat separately.

The apparatus for the estimation consists of a Fletcher's small injector furnace, taking a crucible of two and a half inches, a blower, and a supply of two and a half inch crucibles. This size furnace will work well with the ordinary gas supply. As the blower is the most expensive part of the apparatus those who wish to economise may construct one as follows:—

Procure a large size pair of hand bellows, and get a turner to turn a ring of wood as large as the top of the bellows. The ring must have a groove running round the outside edge and a hole bored in the side just underneath the groove. Cut a hole about one inch in diameter in the top of the bellows opposite to the underneath valve; then take a piece of leather a little larger than the hole and fasten it down on one edge over the aperture, so as to form a valve opening outward from the bellows. Now with glue and screws fasten the wooden ring to the upper board of the bellows. Fix a piece of tube about three inches long in the hole in the side of the ring. Next procure some thin grey sheet rubber, and fasten very tightly with wire over the top of the ring. Now plug up the nozzle of the bellows and see whether your blower is air-tight. Stop the tube at the side with your finger and commence blowing. The indiarubber becomes inflated, but take care not to cause it to burst. You will soon see whether the indiarubber remains inflated after stopping blowing.

The object of the indiarubber reservoir is to obtain a constant, steady draught, which would be impossible with the bellows alone.

If the valve and all the joints are tight attach the short tube at the side of the blower with the burner of the furnace, and, having the gas connected, all will be ready to make the trial.

Take exactly one ounce of the dried and sifted residue (paper ash, chloride, and bromide may be mixed), three ounces of sodium carbonate, and one ounce of potassium carbonate, mix the whole well on a sheet of smooth writing paper, then place carefully into one of the small crucibles, but do not quite fill it. If it will not all go into the crucible add small portions at a time afterwards.

Now light the burner, adjust close to the hole in the crucible jacket, and commence blowing slowly till the crucible is warmed through to prevent cracking. Put the cover on the furnace and increase the heat, regulating it by the gas and air check.

Care must be taken that the contents of the crucible do not boil over. Increase the heat to the full power, and let the crucible remain for five minutes. Tap the crucible lightly with the tongs to detach the small globules sticking to the sides, and then cease blowing, turn off the gas, and let the furnace cool down. When cold break the crucible, and if everything has gone right the metallic silver will be found in a compact button at the bottom, when, having been freed from the flux, it may be weighed. You will then be able to know how much metal your residue contains. If care be taken with the operation it is capable of giving accurate results. I have found that the results on two or three trials of the same residue have not varied more than half of one per cent.

The sulphides are more difficult to reduce. It is advisable to take only half the quantity of residue, heat it gradually, adding about an equal quantity of nitrate of potassium, then add the carbonate of soda and continue the same as for the chlorides.

The metal from the paper fixing and toning baths and paper cuttings contain a certain amount of gold, which, of course, enhances the value. To estimate the gold treat the metal obtained from the reduction with nitric acid, which dissolves the silver and leaves the gold in a state of fine powder, which may be collected, washed, dried, and weighed.

PHOTOGRAPHY AT THE SEAT OF WAR.

By Melton Prior (War Correspondent, *Illustrated London News*).

Between taking photographs at home in one's own garden, or among the hills and dales of quiet English scenery, and photographing amid the stir and bustle of camp life—

> 'Where the broad pennons fly, and the keen steeds are prancing;
> Where mingle war-rattles with war-weapons glancing,'

there is indeed a difference.

It was just previous to my starting for the Caffir War, in the capacity of War Special Artist for the *Illustrated London News*, that I determined upon taking with me a portable camera and a supply of dry plates, together with all the materials for developing and fixing.

These, I conceived, would come in very useful in securing details of costumes, ceremonies, vegetation, and similar objects. Under no circumstances could I hope that the camera would take the place of the pencil and sketch-book in the actual bustle of warfare, during which, riding quickly from one point to another, I have to make sketches with a rapidity and under circumstances which could not be undertaken by any camera I have yet seen. This will be understood when I say that during the movements of troops, or in the heat of an engagement, I have many times made a sketch on horseback in from five to ten minutes on the field, spent, say, half an hour in elaborating it, and, in three-quarters of an hour after opening my sketch-book, have had my drawings off to mail, ready for being engraved in England. I stated my requirements to Messrs. Rouch & Co., who in due time provided me with an efficient outfit. This was anterior to the introduction of gelatine plates, or at any rate when these were in a state too tentative to permit of reliance to be placed upon them, and accordingly the plates were collodio-bromide, of the Beechey class. Although somewhat slow, I obtained several good views and portraits, among which were, I remember, the portrait of the wife of the great chief Tini, Macomo, and others. The development of these were, I recollect, slow in an unpleasant degree for one who lived a hurry-scurry life.

Profiting by the experience gained during this campaign, before starting for the Soudan War, I asked Mr. Rouch if he could not fit me out with a pair of saddle-bags to hold all the necessary apparatus for taking twelve photographs, so that I could have it always with me on horseback and with my camel. This he soon worked out, and in the end I had the most perfect equipment for a dozen photographs. One bag held the camera, lens, instantaneous shutter, &c., and the other contained six double backs, with cloth and tripod. So much was it admired by all who saw it that I had many offers to sell it, and eventually, on leaving for home, did so for the same price as I paid for it, although it had gone through some considerable trials by sun and rough usage.

Instead of troubling myself about developing my negatives, I sent the exposed plates home to England to be developed; and I record it to the credit of the firm by whom the outfit was supplied and the plates made, that they developed in the most successful manner every one of those plates. As to the great advantage of this mode of proceeding to a War Correspondent I need not allude.

There is one thing I would strongly recommend the novice to be careful about, viz., not to wrap up his negatives (before being developed) in the ruby paper; for, in my ignorance concerning the chemical properties of this useful paper, I placed some of it between each plate under the impression that it would be the best means of preventing light getting at the negatives, and, to my disappointment, some six months after when they were developed, to find that they were spotty, and as though fogged, and I was assured by Mr. Rouch that it was solely caused by the chemical action of the paper on the gelatine.

'But how were the plates transferred to and from the dark slides?' it may be inquired. On more than one occasion, and when night had descended, I squatted up against a sand-bank, or even a side of a ditch, had a rug thrown over me, and, with the aid of my lamp, effected all the necessary changes. Of course careful manipulation was necessary; but, for the benefit of those who may be placed in similar circumstances, let me say that no one will experience any real difficulty in transferring his plates provided he exercises due care and judgment. It is well, also, never to be above taking a hint or accepting a suggestion from those who are professedly quite ignorant of photography. I remember on one occasion, when about to take a group of Lord Wolseley and his Staff, at Korti, up the Nile, that I was greatly troubled by the intensity of the light, for it was under an overpowering sun, and the shadows were harsh. 'Suppose,' said his Lordship, 'that we were to transfer ourselves *en masse* to yonder spot' [indicating], 'where it is all deep shadow together.' This was done, and I secured two admirable groups.

Speaking of the intensity of the light reminds me that in these regions of bright sun and blue sky far greater latitude in the exposure is permissible than in England. With the same light and same plates, I have given exposures varying from one to six seconds, and (perhaps owing to the skill of Mr. Rouch in developing the plates) have obtained results so even in quality that one cannot be told from the other. I presume that a tentative system of development must have been resorted to, as I gave no indication of the exposures any plates had received.

Do not, however, imagine that I never met with mishaps. Here is one. When at one of the cataracts of the Nile, our boat sank, carrying with it a package of four dozen plates. They were eventually fished out. When they arrived in England and Mr. Rouch proceeded to examine the contents, he found them glued together in a solid block, which transcended all his powers to get them separated. The warm Nile waters had acted on the gelatine plates and effected their firm cementation, and the smell of the decomposed gelatine was horrible.

The camera stand I employed was one which could be set up in a moment. This is indispensable to a photographer at the Seat of War.

During the Burmese War I exposed a hundred and fifty plates and obtained a hundred and forty good negatives, ten only proving indifferent. On another occasion I sent home ten dozen exposed plates to Rouch, and he gave me ten dozen negatives.

It is absolutely necessary and imperative that the camera be made so as to stand every vicissitude of climate—heat and cold, moisture and dryness. I had mine bound with brass clamps wherever it was likely to be affected. My great friend, the late J. A. Cameron, Special War Correspondent of the *Standard*, who was killed at El Gubat, called me one morning to his tent. 'Look here, Prior; that stupid idiot of a camel-man has dropped my photographic apparatus, and all my double backs are cracked right across!' 'Never mind,' I said, 'we must paste some red paper over them, and they will do very well in a temporary way.' But not so with his camera. This, from not being strongly made, or for some similar reason, let light in, and the consequence was that he did not, unfortunately, take a single negative that was not fogged. The system I adopted in my own practice was to keep the focussing cloth extended over the camera, having a hole in it through which the lens projected. Through the adoption of this precaution I never had a plate fogged.

Although, as I have said, I trust solely to my powers of rapid sketching when riding on horseback, I can conceive of a camera of the detective class which might be useful even during the heat of an engagement. It would have to be suspended around the neck by a strap, so as to allow of both hands being disengaged. It must have a finder, in which at a moment any scene could be examined, the exposure to be made instantaneously, even while the horse was in motion. It would have to be so automatic in working that a fresh surface would be unwound or exposed to the influence of the lens as soon as the preceding view had been obtained. No insertion of dark slides would be possible, and the camera would have to be used as one does a revolver—a 'shot' here and there in quick succession if necessary. When the entire length of sensitive material had been exposed, it should be capable of being removed from the camera, packed up in a roll and sent home by mail for development, another unexposed strip taking its place, and all this effected while out in the field and on horseback. Such is an outline of the future camera for the war artist or correspondent—a camera which can be employed even in the *mêlée* of battle without impeding the free motion of the artist more than does the sketch-book and pencil at present. Who will introduce such a camera?

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BLOCKING OUT SKIES AND NON-ESSENTIAL OBJECTS.

By Thomas Scotton.

Agreeably to the request for a contribution to the Almanac for the information of my brethren of the camera, I beg to state what I have found to be the best means of eliminating, or 'blocking out,' on the negative, objects and other surroundings not required in the finished picture. My services, like those of most other photographers, are sometimes requisitioned for the purpose of producing pictures of (say) machinery, plant, appliances, &c., in bold relief, in order that every part may at once strike the eye unencumbered by any extraneous detail whatsoever. To this end it is necessary of course to block out any such outside objects by some effective means without any injury in the way of warped gelatine, or anything else.

In the Almanac for 1884, it is mentioned that such work can be done by the use of an ordinary writing pen and Indian ink mixed with a little ox-gall. However, having tried several methods, I have found none answer the desired purpose so well as the following.

Take a piece of Indian ink, and, with a little water, rub on a pallet with the admixture of a small portion of orange chrome, until the substance becomes sufficiently opaque; this can easily be ascertained by applying a little of it with a brush on a piece of clear glass. By this mixture, applied with a sable pencil, any outline or delicate part of the negative can be effectually traced over, and thus blocked out with ease. Moreover, should any mistake have been made and too much of the picture covered over, the damp corner of a cloth or piece of rag can soon remove the colour and restore the desired part. Any other part of the negative, not covered by the aforesaid mixture, can easily be filled in with Bates's black varnish, or any other suitable substance.

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HOW THE RESTRAINING ACTION OF BROMIDE WAS DISCOVERED.

By Major Russell.

On finding out that great sensitiveness could be obtained on dry plates prepared with bromide of silver in collodion, and experimenting with a view to discover the conditions most favourable to sensitiveness, at first it seemed as if the more washed the film the more sensitive. The plan was then tried of leaving the plates, after sensitising, to soak in water for twenty-four hours.

The plates thus treated, to my surprise, always fogged badly. On consideration, it seemed plain enough that the fogging must be caused by the too complete removal from the film of soluble bromide which had escaped decomposition by the nitrate bath.

A few trials showed that this was so, and that soluble bromide is a restrainer for bromide of silver, treated with an alkaline developer.

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PREPARATION OF BICHLORIDE OF PLATINUM FOR TONING TRANSPARENCIES.

By S. W. Rouch.

It is well known that bichloride of platinum, when properly prepared, imparts to a collodion transparency a black tone of great vigour. And yet failures innumerable have been made in using it from a want of knowledge how to proceed.

Being a very deliquescent salt, it is usually sold in hermetically sealed tubes containing a certain number of grains, and the usual way to proceed is to break the tube and transfer the contents to a stoppered bottle containing so many ounces of distilled water, in order to make a stock solution of known standard strength. Of this a few drops are poured into water to form the toning bath, and the transparency having been fixed and washed is transferred to it. To the surprise and disappointment of the photographer the picture, instead of assuming the black tone so much desired, begins to bleach and rapidly becomes white. This arises from the salt containing hydrochloric acid.

To prepare it for toning the first thing to do is to neutralise this acid by adding a very small quantity of carbonate of soda previously dissolved in water, and after shaking up for a little, and testing to ascertain that the hydrochloric acid has been neutralised, then add *nitric* acid until the liquid just reddens litmus paper. In this state it is fitted for being employed in toning.

It is, perhaps, difficult to say what precise degree of strength is best adapted for a toning bath, but one thing is very certain, it must be weak—one grain of the salt sufficing for eight to fifteen ounces of water. When the transparency has been toned throughout the entire body of silver forming the image it must be washed, dried, and varnished.

WINDOW AND LAMP TRANSPARENCIES.

By W. Irving Adams (New York).

It seems surprising that use is not made of photographs on paper as a means of providing transparencies for windows or lamp shades. It is thought that for such purposes opal or glass transparencies are indispensable, but it need only be made the subject of a single trial to show that a print upon paper, if properly made, will answer the purpose quite well.

As usually made, a silver print upon albumenised paper lacks sufficient vigour to be viewed as a transparency. Hence the necessity for printing it with a special aim to secure this effect. To do so the paper, instead of being floated upon the silver bath, should be immersed in it; and this, coupled with carrying the printing farther than usual, will ensure such a reduction of silver in the paper as will give a transparency possessing quite as much intensity as will be necessary. I need scarcely say that a print thus made will be unsuited for being examined as a photograph in the usual way by reflected light.

After the print is toned (if necessary), fixed, and washed, it should be rendered translucent by coating it with a suitable varnish, such as a solution of Canada balsam in turpentine.

HINTS ON BROMIDE PRINTING.

By Jas. C. Leake.

The few hints following may, perhaps, be useful to those about to commence this branch of work—one which is coming more into use and favour daily.

The Paper.—All the varieties we have tried are capable of giving good results. They vary in their characteristics: some giving a very bold print, others one of great softness. These peculiarities the judicious operator will, of course, turn to good account, and select the paper according to the negatives and the effect desired.

Exposure.—For ordinary contact printing the paper is, of course, exposed under a negative in the usual manner. We have found an ordinary paraffine lamp the most useful; and when once the proper exposure has been determined the light will keep tolerably constant for some hours. To obtain the best results the exposure should be exactly timed, but it is better to err on the side of over than under exposure.

Development.—Before applying the developer the print should be *thoroughly* soaked. This is important, as, if the paper be not *completely wet through*, dirty, gritty-looking stains will often occur. It should also be noted that the water used for soaking should be frequently changed, and not too many sheets be immersed at one time.

There is no need to give any formula for developer here, as it is always better to use that recommended by the maker; only take care that both the oxalate and iron solutions are made distinctly acid—with sulphuric acid.

When developing prints from very dense, hard negatives, it is well to dilute the developer, even to the extent of one half, and give a very long exposure. It is not always necessary to use all fresh developer for each print. The best plan is to keep two measures and pour the developer back into one after use; part of this may then be thrown away and a little fresh added for the next print.

In every case, whether advised by the maker of the paper or not, it is best to rinse over the print before washing a weak acid solution. We prefer acetic acid; but ten or twenty drops of sulphuric acid to a quart of water will answer quite as well. A careful washing of the print in this will save all danger of yellowness. The acid being poured off, wash well in ordinary water. At first a slight milkiness will be observed, and washing should be continued until this no longer appears and the water runs off clear.

Fixing.—We are inclined to think that the operation of fixing is often too carelessly executed, and some of the earlier prints were undoubtedly not fixed at all, strictly speaking; hence the discoloration which has taken place. The fixing solution should be freshly made and contain from four to six ounces of hypo to the pint. Into this the prints should be immersed, and turned over frequently during, *at least*, *half an hour*.

A sharp look-out should be kept on the hypo bath, and as soon as it shows signs of becoming discoloured it should be thrown away.

We need say little upon the after washing, as everybody knows the importance of this being thoroughly done. We would merely observe that the hypo should be as much washed out as possible *at first*, and the prints laid out to soak for some hours afterwards.

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A PLEA FOR PAPER NEGATIVES.

By John A. Hodges.

The introduction of several really practical and efficient forms of roller dark slides, together with further improvements in the emulsion-coated papers for use therein, has, no doubt, given a great impulse to the practice of negative making on a paper basis in lieu of the—at present—more popular glass.

After a few preliminary experiments, I came to the conclusion that the results I had attained justified me in assuming that, at any rate for landscape work, I had in a paper film everything necessary for the production of high-class negative work; and being aware that I am by no means alone in this opinion, I purpose, for the benefit of those who are thinking of adopting paper in preference to glass, jotting down a few observations which occur to me, the result of a season's work, as my contribution this year to our old and ever-welcome friend, the ALMANAC.

In order to appreciate fully the advantages of working with paper, a roller slide should be used. After a careful inspection of the roller slides at present in the market, I purchased one of Messrs. Morgan & Kidd's, which has two conspicuous advantages over its competitors, namely, simplicity of construction and extreme lightness, my slide for negatives 7½ × 5 weighing only a pound and a half when charged with a roll of paper for twenty-four exposures. Its practical utility is undoubted, for by its aid I have exposed during the summer upwards of ninety negatives, and that without a single hitch and with the utmost exactitude of registration.

But it is of the practical working of the process that I desire to write, though I may premise that most of my work has been done on Morgan & Kidd's negative paper.

The first, and perhaps the chief, objection which has been raised against a print from a paper negative is the appearance of grain in the finished print. Now I do not assert for a moment that grain does not exist—it does, and it is precisely on that account for much landscape work that I claim for paper a distinct advantage over glass, giving, as it does, an effect of aerial perspective and withal a breadth which it is difficult, if not impossible, to attain in any other way. In some paper negatives taken during a recent tour in Wales, the distances are rendered with a fidelity which I have never attained during many years' previous experience with glass. I feel convinced that the use of paper will do more to elevate the character of landscape work than any previous discovery in photography. The assertion which has been made, that a paper negative must of necessity show grain in the finished print, I deny, for I have prints in my possession, taken from paper negatives, which it would be impossible to detect were not printed from glass. Many prints, however, will show a certain amount of granularity when removed from the printing frame, but this entirely disappears during the subsequent operations of toning and fixing. Very apparent grain will always be produced by over exposure, at the same time full timing, short of over exposure, is of the utmost importance, and although considerable latitude exists in this respect, the closest approximation to correct exposure will always give the best results. Under exposure is equally to be avoided, though, somehow, although it is difficult to assign a reason for it, it seems possible to force the development of an under-exposed paper negative to a much greater extent than a similarly under-exposed negative on glass, and in this connexion may be noticed the fact that it is possible to get a much better print from a thin paper negative than from a thin negative on glass. This, I think, must be due to the diffusion of the light in its passage through the semi-transparent paper basis of the negative operating very much in the same way as tissue-paper does placed on a thin glass negative when printing.

As regards development, I have found sulpho-pyrogallol and ammonia to give the best results, but in this matter I would advise any one adopting paper to use the developer to which he is accustomed, as by so doing he is far more likely to achieve success. I have seen work equally meritorious produced by widely different methods of working. Development must be pushed further than would be necessary with a negative on glass; on this point judgment must be exercised, for the appearance of a paper negative is very misleading, it having before fixation greater apparent density than it in reality possesses, the reduction on immersion in the hypo bath being considerable, and the subsequent process of rendering translucent still further reducing the density of the lights. After washing to free from hypo, it is usual, and indeed necessary, to take certain measures to ensure flatness of the film. This is generally effected by squeegeeing on to slabs of ebonite, but a cheaper and equally effective substitute will be found in clean polished sheets of tinned iron, previously varnished, to be obtained for a few pence at any ironmonger's. Then, finally, comes what is certainly the most objectionable part of the whole process—namely, the rendering of the negative transparent. It is not absolutely necessary that this should be done, but if dispensed with the time occupied in printing will be inconveniently protracted. After trying many methods which have been suggested, I have come to the conclusion that none are so effective as the application of liquid vaseline, as sold by the Vaseline Company, applied to the back of the negative without heat, but sufficient time must be allowed to enable the mixture to thoroughly permeate the pores of the paper. Finality in the direction of transparency seems almost to have been reached in the recent production of the Woodbury tissue. Until a more perfect means of rendering the negative transparent is invented, it is doubtful whether negative making on paper will become as popular as the process deserves. At the present time one may see exhibited in shop windows trade notices printed on a paper the transparency and translucency of which is almost perfect. No doubt the process is the subject of a patent, but possibly arrangements might be made with the proprietors to the advantage of photographers generally. Here, surely, is a wide field for experiment, and if those indefatigable individuals who are continually ringing the changes on our existing developers, and proposing modifications, would but devote their energies to experimentalism in this direction, possibly their efforts might be rewarded by such a discovery as would eventually lead to the complete supersedence of glass by paper. On the artistic merits of the paper negative I have already touched. In conclusion, I will add that it is my firm conviction that to paper we must look for the furtherance and advancement of photography from an artistic point of view, and to those whose aim it is to do this I say, *work paper.*

PORTRAITURE IN THE EVENINGS.

By Colonel Draper.

Provided with a battery consisting of six common gas-burners, no one need experience any difficulty in obtaining portraits at night.

I have them arranged so that there are four towards one side of the sitter, and two at the other, all of them being a little in front. This gives a fine disposition of light and shade. They are all provided with reflectors, and are masked so that none of the light enters the lens.

EPITOME OF PROGRESS DURING 1886.

By the Editor.

ARTIFICIAL LIGHT IN MAKING LANTERN SLIDES.

It is the opinion of Mr. George Smith that in the making of a high-class lantern slide artificial light is an essential condition for success. 'In the first place,' he says, 'the eye is more dilated at night than in the day, and therefore better qualified to judge both detail and density; secondly, without any pretension to absolute accuracy, which is by no means necessary, any one can judge very nearly if his oil lamp or gas burner is giving the same amount of light as usual, and with ordinary care have far more regular data of exposure than would be possible with the ever varying intensities of daylight; and lastly, because the eye being more dilated, the progress of development is more easily watched, and the proper moment for its arrest more accurately judged than would be the case if the exposures were made by daylight, and the development conducted by the same artificial light. I may here mention that my own experience is that a lamp with an opal globe is the best light by which to judge the density or depth of tone of a finished lantern slide. It should then appear full of detail in the deepest shadows, but not thin. The same slide seen against a ground-glass globe on the same lamp would appear thin and weak. By daylight it would be impossible to judge at all accurately, except by comparison with one of approved density; on a bright day it would probably be considered weak, and on a dull day too dense.'

THE FINDER IN THE DETECTIVE CAMERA.

The finder forms an essential feature in the construction of the detective camera. It consists of a lens of very short focus and large aperture, usually non-achromatic; indeed, one finder objective which we have recently examined consists of two simple convex lenses mounted close together, a ring of brass being placed between so as to prevent them from touching. This is set in a box about two inches square, which has in it a small mirror placed diagonally so as to throw the image against a square of ground-glass placed in the top of this miniature camera. In the top of the outside case, and also in its front, are cut a square and circular opening respectively, the arrangement and location of these being as close to one of the upper corners as convenient, so as to have the finder quite out of the way of the cone body which forms the working camera. Sharpness of definition in the finder is not at all necessary; the great object is to secure such a large volume of light as will enable the worker, when looking down upon the ground-glass, to see with sufficient plainness what is in front. In this way he can move his own position, and also that of the detective camera, until he sees the subjects at which he aims clearly and centrally depicted on his finder. This being done, he instantly presses the exposing button, and can feel certain of his having secured a negative of the objects then observed.

STUDYING THE SITTER.

Speaking of posing, Mr. Hume Nisbet says that the true photographer 'ought to be a reader of faces—a close scrutiniser of the inner workings of the subject before him; catch with an eagle glance the peculiarities of gait, the tricks of motion; and be gifted with the rare discrimination which can separate the natural habits from the society affections. I think a photographer ought never to be in the studio when the sitter first enters. He or she ought to be left a little time alone, or, rather, a special chamber ought to be set apart where the sitter may enter, with attractive objects to attract the attention placed about the room, while the artist, for a few moments, from an unseen point, may watch and study his subjects when they think themselves unobserved; afterwards let an *employé* enter and address the sitter while he still watches from his point of observation, by which means he may judge and learn what the sitter is in a natural state alone and the sitter in society. And so he may wait, after the instantaneous plate is in the camera, for the moment when the sitter unconsciously looks natural to flash the light upon her; indeed, I have thought if the studios could be so constructed that the operator need never enter the room at all, but have the camera so adjusted from an outside room that the sitter might not know the moment they were taken.'

DETERIORATION OF HYDROKINONE.

Dr. Eder says he has discovered that chemically pure hydrokinone loses its powers after some years. It changes but slightly in colour. A solution in alcohol, however, is dark brown, and no longer possesses its full developing power. With such a preparation no good images can be obtained, unless the hydrokinone be recrystallised from a dilute aqueous solution of sulphurous acid. In the presence of a little sulphurous acid hydrokinone keeps better. As a test for the goodness of hydrokinone, a solution may be made equal to one in ten, which at the utmost should only be light brown, and must be transparent.

DEVELOPING TRANSPARENCIES ON GELATINO-CHLORIDE PLATES.

In course of a demonstration of transparency making at the Photographic Society of Great Britain, Mr. B. J. Edwards having reminded them that a short exposure and strong developer give black tones, whereas a full exposure and weak and restrained developer give warm tones, said that his developer was composed as follows:—

Solution A.

Neutral oxalate of potash	2 ounces.
Chloride of ammonium	40 grains.
Distilled water	20 ounces.

Solution B.

Sulphate of iron	4 drachms.
Citric acid	2 ,,
Alum	2 ,,
Distilled water	16 ounces.

To get black tones in the finished slide he mixes the above solutions in equal volumes. The prepared plate is placed behind the negative in an ordinary printing frame, and exposed to diffused daylight from two to twenty seconds, according to the strength of the light and the density of the negative; full exposure in a dull light gives the best results. When the negative is thin, it is a good plan to cover it with opal glass, and to lengthen the exposure sufficiently to make up for the reduced intensity of the light. Another method is to expose to the light of burning magnesium. The printing frames can be so arranged that several of them shall be equidistant from the light, and thus several plates can be exposed by burning one inch of magnesium wire. As the development goes on the plate is watched from time to time by yellow light, and when the image is out it is washed; it will then be found to be of a rich black or purple colour. When the exposure is increased, and the developer is weakened by being mixed with an equal volume of water and some restraining bromide, red tones are obtained; a good plan is to mix two developers, the one weak and the other strong, then to put the plate in the weak one first; if it prove not to be strong enough, the plate can be taken out of it and put in the other one, by which means latitude of exposure is gained. Several plates may be fixed in the same solution, but after it is mixed it will not keep long. The slide is next fixed in a solution of two ounces thiosulphate of soda in sixteen ounces of water, after which a clearing solution is applied, consisting of sulphuric acid half an ounce in twenty ounces saturated solution of alum; this is poured repeatedly over the plate until the slight deposit of oxalate of lime, caused by the lime in the washing water, is removed. The positive is then washed well. In the manipulations just described, great care must be taken that not even a trace of thiosulphate of soda finds its way into the developing solution; separate dishes must be kept for the developing and fixing solutions; they must also be kept clean; a trace of the fixing solution in the developer may increase rapidity, but for lantern slide purposes it spoils the image, and makes all the difference in the quality of the transparency.

JUDGING OF DEVELOPMENT.

When the whole surface of the film is well brought out, development should cease, though it appears all white on the back. I have had plates of which this statement was true, and have found them more difficult to judge by reflected light regarding their density than any other. Viewing by transmitted artificial light is here a necessity, and is the only way to tell when the development has been carried far enough. By holding the negative up to a certain standard oil or gas lamp, distant about three inches, for a moment, the eye can quickly judge whether there is any solid detail in the shadows or sufficient opaqueness in the high lights. And for any one using a brand of thickly-coated plates, where diffused ruby daylight is preferred during development, I would advise the employment of a lamp which could be kept burning low, and turned up only as you wished to examine the state of the negative. By this means you can familiarise yourself with the appearance of the plate in the different stages of development, and soon learn when to stop.—F. C. Beach.

SIZE AND SHAPE OF LANTERN SLIDES.

'The size generally adopted for a lantern slide,' says Mr. W. Brooks, 'is three and a quarter inches square, being a very convenient size, with a quarter of an inch margin, which gives the sight of the picture two and three-quarters of an inch square. By square I mean the so-called cushion shape—that is, square, with the four corners rounded. All lanterns of any pretensions are fitted with condensers of four inches diameter, and this will take nicely the shape above named without any falling off at the corners, the diagonal of the opening of the masks I use for the purpose being three inches and three-quarters. If the lantern is fitted with condensers of three inches and a half diameter only, masks with round openings can only be used for all pictures, unless one is satisfied with only small-sized pictures.

'To avoid mistakes, the masks for lantern slides are best made of what is known in the paper trade as surface paper, that is, paper black one side and white on the other, the black side being placed towards the film, and the white side towards the cap glass, and on this white side of the paper the name of the subject can be written with pen and ink. The white side is also very convenient, as it can be easily seen in a very dull light by the operator. In making slides for amateurs, I generally mount them in this way, but I think a more elegant way is to use masks black on both sides, and write the title in white with a pen. To do this, get a bottle of Chinese or permanent white, which can be obtained at any artist colourman's, empty the contents into a much larger bottle, and thin down with water, stirring well with a piece of stick kept for that purpose, to a consistency that will flow in an ordinary fine-pointed pen. Or, if the title is long, it is best to use a steel pen called crow-quill size, and sometimes called a lithographic pen; the writing is then quite as easily done as with an ordinary pen and ink. The white must be occasionally stirred or shaken up, as the pigment being heavy soon settles.

'The shape of opening of the mask is a matter of taste and judgment according to the subject; for ordinary landscape or interiors, the cushion shape will generally be found the best, except in some instances where there is something objectionable in the corners, then a circular opening may be an improvement. Or take the subject of a distant landscape with too much of a grassy field in the foreground, the circular shape decidedly will be a very great improvement; in few instances an oval will be a greater improvement still, but it is all according to the subjects. I think for portraits the oval form is far superior to any other.

'In many instances, the square or cushion-shape is not suitable to the subject, especially where slides have to be made from negatives not taken for that purpose. The $7\frac{1}{2} \times 5$ and the $7\frac{1}{4} \times 4\frac{1}{2}$ size negatives are mostly very unsuitable to contract into a square shape, unless the sides contain unimportant matter, and can be cut off; if the whole of the subject has to be included, it is better to make a mask of the same proportions. In some instances, the sky can be made higher; if the subject be a flat country scene, then the sky being made higher will give a better representation of the flat or marshy country, but if the subject be mountain scenery, making the sky higher would have the effect of dwarfing the mountains, which would not be truthful, which I think will be readily understood, just the same as in mounting an ordinary portrait the higher the subject is mounted the taller he or she looks, and the lower the shorter, and it is just the same with the landscape subjects before alluded to. Many pictures are entirely spoiled by injudicious mounting, whereas, with a little care and taste, their value would be greatly enhanced.'

FRENCH LAW AS REGARDS THE OWNERSHIP OF A PORTRAIT NEGATIVE.

In France the subject of the right of ownership has been definitely settled by the Law Courts. It has been decided that negatives are the sole property of the photographer, and cannot be claimed by the sitter, the latter having only right to the *carte-de-visite* or other prints ordered from the artist. The photographer has no right whatever to sell or expose the portraits of his customers without special license from the family. This lawsuit was brought against the heirs-at-law of the celebrated sculptor and photographer, Adam Salomon, who would not consent to give up the negative of a certain celebrated countess to her family. The latter lost the lawsuit, and now photographers know how far they are protected by French laws.

A CAMERA WITH A REPEATING ACTION.

At a meeting of the Photographic Society of France a camera capable of producing a variety of effects was submitted by M. Bretagne. In this the back part is capable of every transformation. A whole-plate can be divided into portraits of postage stamp as well as much smaller or larger size. This effect is obtained by the addition of a supplementary frame upon the back of the camera; this frame slides from right to left. In the frame, four rolling shutters are adapted so that if pulled out they meet together, leaving a hole smaller than a quarter of an inch square. Whatever may be the size of this hole, it is always in the axis of the lens. Supposing that the two side blinds be drawn together and leave a space of an inch wide, we shall have a long slit of light of an inch in width stretched from the top to the bottom of the ground-glass. Now, if the bottom blind be lifted to within an inch of the top, a square hole will be obtained; and if the multiplying slide be drawn from right to left, a series of images, one inch square, will be obtained all along the top of the plate. The dark slide is then closed, the bottom blind is allowed to fall one inch, and the top blind is now drawn down one inch in order to cover that part of the plate already exposed. The same manœuvre is gone through, and another series of views or portraits obtained. This can be continued until the whole plate has been exposed. By the aid of this apparatus many artistic arrangements can be made. The inventor presented two or three proofs to show what could be done. On one could be seen, in the centre, the view of a mansion, all the family and friends were grouped upon the lawn. This picture was half-plate size. At each end a full-sized portrait of the master and mistress, and all along the top and bottom of the proof the busts of each member of the family. The other print represents the view of a number of firemen with their pump in the centre, and half-plate size. On the right and left were whole-size portraits of the officers, and the whole was surrounded with the busts of the men. This had a very pretty effect. In fact, the plate can be divided into any sized squares or parallelograms whatever, according to the taste or artisic skill of the operator.

A NOTE ON PATENTED ARTICLES.

A CASE of some importance to patentees has been decided in the Law Courts, to which it may be well to direct attention now that so many patents are taken out in connection with photography. The prosecution was instituted for selling an article as a patented one, when only a provisional specification had been lodged. A conviction followed, and as this was the first case of the kind under the new Patent Act, and evidently a misconception had existed, only a nominal fine was imposed. It seems to be pretty clear that the term 'patent' or 'patented' cannot legally be used until the patent is actually sealed. Up to this stage the only term that can legally be applied is 'patent applied for;' and this appears to be consistent, inasmuch as no patent is really in existence. But what about a manufacturer describing his goods as 'patent' after the patent itself has expired? Clearly after a patent has lapsed it is no longer in existence. This point may some day arise, particularly now that patents can be obtained for short periods at such a small sum.

SOME OPTICAL FORMULÆ OF USE TO PHOTOGRAPHERS.

FROM a paper read by Mr. G. L. Addenbrooke at the Photographic Society of Great Britain, we make the following extracts, which relate to the distance the lens should be from the object and the ground-glass respectively, and to the dimensions of objects:—

The formulæ to which I particularly wish to direct attention are two: the one the well-known elementary formula of lenses, and the other a derivation from it.

The first is usually written—

$$\frac{1}{P}+\frac{1}{P^1}=\frac{1}{f}.$$

The second is—

$$\frac{I}{O}=\frac{f}{P-f}.$$

The factors represented are, in the first equation—

P, the distance from the lens to the object in inches;
P^1, the distance from the optical centre of the lens to the ground-glass in inches;
f, the equivalent focus of the lens in inches.

In the second equation—

I, the length or greatest dimensions of the image in inches;
O, the length or greatest dimension of the object in inches;
f, as before, the equivalent focal length of the lens in inches;
P, as before, the distance from the object to the lens in inches.

Now let us take each formula separately and see what we can do with it, and afterwards combine the two together and see what we can make of them in combination. Taking the first formula—

$$\frac{1}{P}+\frac{1}{P^1}=\frac{1}{f}.$$

If we know any two of the factors we can, of course, always find the third. I will not allude to all the possible applications which might be made of the formula, but only to a few of the principal. First: Suppose your camera comes out to twelve inches, that you have a lens of eight inches focus, and want to know the nearest distance at which you can place an object to be copied. Here we want to find P, and we know P^1 and f. Place these figures in the formula—

$$\frac{1}{P}+\frac{1}{12}=\frac{1}{8},$$

resolving the fractions by taking 24P as the least common denominator, the equation becomes—

$$24+2P=3P;$$

or,

$$P=24,$$

therefore the least distance is 24 inches.

Again, we have a camera coming out to fifteen inches, and we wish to take a portrait of a person twelve feet or 144 inches off, with a twelve-inch focus lens; can we do it?

Here we have a choice of data, and the sum can be worked out three different ways. Let us take figures for P and f, then we have—

$$\frac{1}{144}+\frac{1}{P^1}=\frac{1}{12};$$

or,

$$P^1+144=12P^1;$$

or,

$$-11\cdot P^1=-144$$

$$11P^1=144$$

$$P^1=13 \text{ inches, roughly.}$$

Now our camera comes out to fifteen inches, and therefore we can do what we wish quite easily.

Again, our camera will come out to sixteen inches, and we wish to take a photograph of something from which we can only get four feet off; what is the longest focus lens we can employ? Here we know P and P^1; therefore—

$$\frac{1}{48}+\frac{1}{16}=\frac{1}{f},$$

or,

$$f+3f=48,$$

$$4f=48;$$

or,

$$f=12 \text{ inches.}$$

It is, I think, unnecessary to say anything more under this heading; let us therefore turn to the second equation—

$$\frac{I}{O}=\frac{f}{P-f}.$$

It will be seen that this equation is more comprehensive than the last. It deals with the relative sizes of the image and object, and although apparently less known is, I think, much more generally useful to photographers than the first formula. Indeed, it is really wonderful what a number of practical and important points in everyday work can be calculated by its use, often in one's head, which would take considerable labour to ascertain by direct experiment. I will endeavour to briefly indicate its applicability under the following heading.

Enlarging.

Let us suppose that we have all the apparatus we require for making enlargements up to 12 × 10; we wish to enlarge from a quarter-plate to 12 × 10: how far must the negative be placed from the lens? Say the length of the quarter-plate is four inches, and the focal length of the lens we intend to employ is six inches, then—

O in our formula is 4,
I ,, ,, 12,
f ,, ,, 6,

Therefore—

$$\frac{12}{4}=\frac{6}{P-6};$$

$$\text{or, } 12P-72=24;$$

$$\text{or, } P-6=2;$$

$$P=8;$$

that is, the quarter-plate must be placed eight inches from the lens.

If, on running out our camera to the full extent, we find it is not long enough to focus the image, then of course a shorter focus lens must be employed, and we must do our sum over again and find another value for P. Thus simply can questions relating to enlargement be settled with sufficient accuracy for practical purposes.

MEDALLIONS.

In reply to some inquiries that have been made as to the best method for turning down the metallic rims of medallions, Mr. E. T. Shelton says: 'From experience I find the following method of procedure to be always successful. The glass upon which the picture is mounted, and the back, being placed in their proper position in the rim, the whole is placed face downwards upon a board, sufficiently solid that it will not easily give under the pressure which is to be used, otherwise it will probably end in the glass getting broken. The rim should then be *slightly turned over all round* by means of a steel rod, or perhaps better, as I myself find it, the back of a large key, the handle of which affords a better hold in the hand, and so on until the back is perfectly flat and level. Other methods have been proposed, but I have never heard of any kind of pliers being supplied suitable for the purpose, although I believe there are firms who send out some sort of block in which the rims are placed to be turned down; these would not, however, dispel the difficulties which have been found to present themselves, and would, moreover, necessitate the keeping of a separate block for each size or shape of rim to be used.'

EFFECT OF TEMPERATURE UPON DEVELOPMENT.

Having made experiments with a view to ascertain whether, under any circumstances, it was possible to get more out of a plate after a given exposure by warming the developer than could be obtained otherwise, the result was in every instance negative. The conclusions arrived at were as follows:—

That raising the temperature accelerates development, chiefly at starting; that it tends to abnormal reduction of the silver in the film, as well as to mechanical staining by the developer; that it necessitates a larger proportion of bromide than the normal—or what is probably equivalent—a smaller proportion of ammonia, in order to produce the best result.

That lowering the temperature considerably increases the time required to start development, but when once started the action proceeds regularly. It leads to the production of clean, bright images; it will admit of a considerable increase of the normal quantity of ammonia, or a corresponding decrease of bromide, in order to hasten its action. And that, in fact, unless the reduction in temperature be carried too far, it is an advantage rather than otherwise.

In arriving at this last conclusion, we (THE BRITISH JOURNAL OF PHOTOGRAPHY) are not of course referring to the detailed experiment alluded to above, as that represents the extreme to which the lowering could be carried. But from what we have seen of the behaviour of moderately cool solutions as compared with those of summer temperature, we believe photographers will find it to their advantage to employ artificially cooled solutions during hot weather, this quite independent of any beneficial action in the prevention of frilling.

TESTING PAPER FOR DISCOLOURISATION.

IT may be remembered that a question was raised referring to the permanency of certain pictures, but was shown to have been unnecessary, as the alteration—taking the form of a degradation of the whites—seen was proved to be owing to the peculiarities of the paper basis upon which the pictures were made. Though it is not given to every one to be an expert in the paper trade, there have recently been described certain chemical tests which show with ease whether wood, for instance—the great sinner in respect to colouration by time—is present or not in a given sample of paper. It is stated that solution of orcin mixed with hydrochloric acid gives a splendid dark red on wood, and upon paper partially composed of wood a dark red-violet spot. Paper made of pure cellulose undergoes no change. Resorcin, with alcohol and hydrochloric acid, colours wood-stuff paper a violet-blue in a short time, pure cellulose paper being unaffected. If sulphuric acid be employed instead of hydrochloric (in the proportion of three volumes of alcohol and one of this acid, used warm), wood paper or wood will be coloured a dark violet-blue, while pure cellulose paper turns to an 'onion-red.'

ART IN PHOTOGRAPHY.

NORMAN MACBETH says:—'Very few who have not received an art education see its importance, and many are apt to think that anything is a picture if it be taken from nature, and successfully developed. Now, a photograph in itself is not a picture, however accurately it may be focussed. To constitute it a picture, it must not only have an idea, and purpose, communicating a something to the person who sees it; it must have more, for a diagram or map may have all that. An essential qualification of the pictorial is the presence of beauty, sentiment, and feeling. These must be in it, according to the subject. To produce these the artist must possess those qualities of mind, or he will never see them in nature, and far less awaken them in others by anything he may do.'

INDIARUBBER A CAUSE OF SPOTS ON DRY PLATES.

A MANUFACTURER of dry plates once exhibited to us a series of negatives all spoiled by reason of a number of minute spots irregularly interspersed over the film; he had traced them to the use of certain plate boxes employed for storage purposes, but further than that, in elucidating their cause, he could not discover. Ultimately, he found them to be due to the use of vulcanised rubber bars, used as buffers in the boxes to prevent jolting. He substituted leather, and all the troubles instantly disappeared. Every one who has made use of indiarubber corks or tubing is aware of the continuous supply of powdery matter which separates from them for some time after being taken into use, and it needs no argument to show that in many cases this separation, if the particles consisted of sulphur, might be productive of serious evils. As a matter of fact, this loose powder may consist of sulphur, or of that substance combined with powdered talc, used as a 'filling;' and a serviceable method of getting rid of it would be useful to be acquainted with. It cannot be got rid of by mere washing in water, and especially is this so with the interior of tubing. The plan to adopt is—first to well knead, or beat, the articles in warm water, so as to loosen the adherent powder, and then to subject them to the action of a chemical fluid in the following manner:—One part of sulphide of sodium and two of caustic soda are dissolved in water, and the vulcanised articles boiled in the solution for some time, each being taken out, and reimmersed, at intervals, the tubing in such a way as to render it certain that the fluid acts upon its inner surface. The articles can then be well washed in pure water, when they will be found very clean, and greatly improved by the process.

SILVER STAINS ON GELATINE NEGATIVES.

A correspondent of The British Journal of Photography says, in reply to a query as to the removal of silver stains from a negative that has been printed from before being varnished:—'I have several times removed these by immersing the negative in hypo of the ordinary strength, and gently rubbing with the ball of the finger the parts affected. I have never yet failed, although I think it better to avoid the stain by varnishing. The rubbing must be used with considerable caution.'

ENLARGING SIMPLIFIED.

Accompanying some excellent enlargements which we received from Mr. Harold Power was a brief account of the method by which they were produced. He says:—

'I attach to the end of a drawing-board two rings, by which I hang it on the wall of my room in the same way as a picture. To the board I fasten with pins a sheet of white paper of the size to which I intend to enlarge, carefully marking in pencil the position of the paper. My lantern, which has a triple wick, I place in front of this board, and adjust the height, either by raising the table or lowering the board, until the circle projected from the lantern equally surrounds the sheet of white paper. I then proceed to focus.

'Now these arrangements may not be mathematically correct, but in practice they answer well; and I submit to you two of these enlargements, that you may judge of the work done. I may add that these were made on Marion's Alpha paper, and developed with pyro and ammonia, which accounts for the ivory tint in the high lights, but to which I do not at all object; and I find the picture softer than when the result is black and white.'

We are in a position to add to this that Mr. Power now employs an Argand lamp in preference to that mentioned in his note.

LANTERN CONDENSERS AND OBJECT GLASSES.

The Editor of this Almanac writing elsewhere on this subject, and in reply to the question, *What is the use of a Condenser?* says:—

I.—The Condensers.

If a light—no matter of what nature or intensity—be placed at a distance of two or three inches from a transparency, every part of such picture will be illuminated. But a spectator in front will not see all the transparency illuminated, but only that portion of it which is in a line between his eye and the light. All the rest of it will be dark. In like manner, if a lens were placed in front for the purpose of projecting an enlarged image of the picture, no more of the picture will be projected than the spot in the line of light, or axis. What is required is that the light shall be so manipulated, as it were, that when the spectator's eye, or the enlarging lens, shall be placed at a given distance in front of the transparency, every portion shall be seen under the same conditions as to bright illumination as formerly characterised the centre or direct line of light. It is the function of the condenser to effect this end. A large number of rays diverging from the lamp falls upon the condenser, and it projects them forward in a converging form, the apex of the cone of illumination being a place where, if the eye or lens be placed, either will see the picture which is interposed in such cone brightly illuminated from side to side. It will from this be seen that the size of the transparency that can be illuminated must of necessity be rather smaller than the condenser which forms the base of the cone of light.

As regards the best dimensions for a condenser, this depends entirely upon the size of transparency that is desired to be exhibited. A very popular size is three and a quarter inches square. When this is mounted with a mat having a circular aperture of from two and three-quarters to three inches diameter, then will a condenser of three and a half inches prove adequate for its illumination, and for such a picture we would not recommend anything larger.

But it is far from being expedient to confine ourselves to a mat of such form and dimensions, for a most useful and pretty shape of aperture is one of a cushion form, in which the opening is square, with rounded corners. To exhibit this correctly, a four-inch condenser is absolutely necessary. And even with a condenser of four inches diameter it is bare work to get the picture illuminated well to its corners unless it is placed close to the condenser, which is not always expedient, for the framework in which the picture is encased and held during exhibition necessarily takes up some space, and brings the picture nearer the apex of the luminous cone, the area of illumination being consequently diminished.

While making experiments on this subject, with a view of giving the best possible advice to the readers of this article, we have had constructed four-and-a-half inch condensers in lieu of the four-inch ones, with which a favourite lantern has hitherto been fitted. We find such a great gain to result from this that we are justified in advising the adoption of the larger diameter by preference.

But it may here be stated in reply to a question, which we can readily understand it may be in the minds of some to put—Why not make a large condenser at once, so as to answer every purpose? It is not advisable that it be any larger than will just suffice to answer the required purpose, because a large diameter necessitates flat curves, which imply a long focus and less illumination than when the focus is short.

As to the form of the lenses, of which a condensing system is composed, opinions differ. But we may here pause for a moment to observe that we have been employing both the singular and the plural in regard to the condenser. Nothing more is meant than this—that a good condenser, such as the class of which we are now treating, is invariably composed of more than one lens. Two is the usual number, but sometimes three, or even four lenses go to making up a system. Hence the plural term.

The most popular form of condenser at the present time consists of two similar plano-convex lenses, mounted flat sides out, and so close together as to nearly touch each other in the centre. Although this cannot be considered as an optically perfect system, yet it answers so well for the projection of photographic transparencies that we endorse its employment. For many years a plano-convex lens, flat side next to the light, and a double convex of crown glass have been employed, but this is now being gradually supplanted by the two plano-convex lenses described. The most perfect system of this class is when the face of the lens nearest to the transparency is not quite flat, but slightly convex.

A great increase of illumination is often to be obtained by the interposition of a third lens between the light and the condenser. The form of this lens should be plano-convex, or, by preference, of a slightly meniscus shape, although from such trials as we have made we do not find any very marked degree of advantage in the latter. The gain in illumination arising from the employment of a supplementary lens, such as that described, was proved in one instance to exceed thirty per cent. But as this third lens will necessarily be close to the light, it must not only be placed somewhat loosely in its setting—to allow of expansion of the glass by the heat—but it must be warmed up slowly and thoroughly before being introduced into the lantern, otherwise the heat may cause it to crack.

The great object in a condenser is to collect the largest possible amount of light emitted from a burner, and cause it to be projected forward to the object glass in a manner as free from observation as possible. When the condenser consists of two lenses, the first one collects the rays of light which diverge from the flame, and transmits them in a nearly parallel manner to the second, its function being to converge them to a point at a distance equalling the position of the front lens of the object glass, or nearly so. If the eye were situated at the apex of this cone, it would perceive the whole of the condenser to be one mass of intense illumination, no one part being brighter than another.

It may be asked why one lens would not answer the purpose of a condenser instead of two. We reply that it is not possible to effect the transmission of a large angle of light by one lens alone. While some of the cheap toy lanterns have a single condenser of the 'bull's eye' or hemispherical form, yet is the angle of light transmitted but small, owing to the spherical aberration of single lenses having short radii of curvature. Hence must a good condenser consist of at least two elementary lenses.

We may here observe that if the purpose of the lantern be the production of enlargements from negatives of cabinet or greater size, then must the diameters of the condensers be increased in a corresponding ratio. For purposes of this nature, the condensers may with advantage be eight inches in diameter.

II.—The Object Glass.

The sole function of the lantern objective is to form an enlarged image upon the screen of the transparency, which is placed at its focus.

Before we can answer the question as to what is the best form of object glass, it will be necessary to understand what the lantern is required to do. For example, if one is very circumscribed as regards the space between the lantern and the screen, the objective which we consider to be the best under average circumstances will not answer. Again, it is frequently desirable that the screen be placed at a great distance from the lantern, as, for example, when the place in which the exhibition is held is a long room, a hall, or a church, in which the screen is erected in front of the spectators, and the lantern is fixed in an elevated position behind their backs, the projection being effected over their heads. These conditions we will treat *seriatim*.

For parlour entertainments it is desirable that the focus of the objective be as short as possible, so as to obtain a large disc when the lantern is placed close to the screen. Many years ago, previous to the employment of photographic lenses in the lantern, the focal power of the object glass was such, that in order to cover a certain disc it was merely necessary to erect the lantern an equal number of feet in front (or behind) the screen. Thus, if the lantern stand were placed eight feet from the screen, one could calculate upon an eight-foot disc being properly illuminated. The objective, by which the condition was fulfilled, was somewhat analogous to the photographic single combination landscape lens, only instead of being composed of one achromatic lens, it was formed of two non-achromatised lenses, mounted close to each other, that next the picture being a plano-convex lens, the other being a meniscus, the convex sides of both being next the transparency and a large diaphragm being situated at a little distance in front. Any one who wishes to practise economy in regard to the optics of a lantern, will find this to form a tolerably good objective, and one which is far from being costly, seeing that none but single crown glass lenses are employed.

A refinement upon this objective consists in the employing of two plano-convex achromatic lenses, each about eight inches in focus. These should not be less in diameter, if possible, than one inch and three-quarters. They must be set in a short tube, convex sides nearest the picture, and separated from each other just such a distance apart as to prevent their touching. A large diaphragm, much larger than what would be employed in photographing, is placed a short distance in front.

This forms an objective which is much liked by many experienced lantern operators, because when they find themselves in a confined place they are masters of the situation, as they can be certain of having a large disc, with good definition, without being compelled to erect the lantern at a great distance from the screen. But this is not all; for by having several lenses of the same diameter, but of different foci, and all interchangeable, the exhibitor is more than ever the master of the situation, for he can now set the element of distance at complete defiance, and erect his lanterns either ten or twelve feet away from the screen, or place a space of forty or sixty feet between them.

The image thus obtained is sufficiently sharp for all ordinary purposes of projection, and is quite free from chromatic fringes. It must be understood that when only one of the lenses is to be employed, in order to accommodate a long distance intervening between the lantern and the screen, then must there be an adapting tube of tin or brass attached to the lantern, to suit the lengthened focus of the objective that is being used. The distance between the light and the condenser must also be slightly diminished in proportion as the focus of the objective is increased, so that it will be seen that if the atmosphere of the room in which the exhibition takes place be clear, the disc will be better illuminated by employing an objective of long focus, with the lantern at a distance, than when the opposite conditions prevail.

Of all forms of lens, by far the best definition is obtained by the employment of an achromatic portrait combination—one which has been constructed for a *carte* portrait, for these usually have large apertures and are well corrected for flatness of field—this latter quality being quite indispensable in lantern projection. It unfortunately happens, however, that equality of the highest class of definition is only obtained when the lens has a focus so long as to necessitate a considerable distance between lantern and screen. French quarter-plate portrait lenses answer tolerably well, but owing to the smallness of the diameter of the back lens much light is lost. To obviate this, the majority of lanterns of the better class now being constructed have an objective which, while similar in appearance and focus to the French quarter-plate lenses, yet differs from them in respect of having a back combination of larger dimensions than the front lenses. This ensures the transmission of a greater volume of light to the screen.

The most useful form of lens of this class is one we introduced several years ago, in which the back lens was two and a quarter inches in diameter, and the front lens one inch and three-quarters. There was a great excess of negative spherical aberration in the back lens, by which a very flat field was obtained with a short focus.

DOUBLE SALTS.

The subject of double salts has always had a special interest for photographers, and some interesting facts as regards those of silver have been published, and a brief *resumé* of them may be here given. When a solution of nitrate of silver and pure saltpetre is slowly concentrated, the latter salt begins to crystallise out first, but when the two salts reach a proportion of at least three molecules of nitrate of silver to one of the nitrate of potash, crystals of a double nitrate of silver and potash begin to form. Indeed, this salt, it appears, is always formed when the salts are present in such quantity that both can crystallise simultaneously. When the crystals are placed in water the silver salt may all be removed. When ammonia replaces the potash, it is found that the crystallisation occurs in a reverse manner. The silver salt first begins to crystallise out as the solution is concentrated, but, after a time, crystals of a double nitrate of silver and ammonia form, their shape being similar to those of the previously-named double salt. Nitrate of soda and nitrate of silver also crystallised together, but in such an irregular mode that no definite compounds were obtained, although the silver salt crystals had the same character as the soda instead of their usual form.

EMULSION MAKING FOR AMATEURS.

Mr. Thomas Earp describes in The British Journal of Photography his method of proceeding, believing it will be found to result in all respects satisfactorily.

The formula which I have found to prove most useful, though only slightly modified from others published, is as follows. For ten-ounce emulsion take—

Potassium bromide	50 grains.
Ammonium bromide	110 ,,
Nelson's No. 1 gelatine	20 ,,
Water	7 ounces.

Place a jar containing this in a vessel of cold water and raise the water to boiling point, when *immediately* remove the jar. Have ready weighed out—

Silver nitrate	200 grains in crystals,
Potassium iodide	6 grains,

dissolved in half a drachm of water.

In the dark room add the nitrate of silver to the bromised gelatine, and proceed to beat up vigorously for about five minutes with a horn or silver fork, then pour in the solution of iodide, and again beat up for some time.

Now proceed to acidify with hydrochloric acid, and test with litmus paper till there is an acid reaction, the paper turning clearly red. No definite quantity of the acid can be prescribed, as I have found that in some cases I have been obliged to add as much as eight drops of strong acid to get rid of alkalinity, while in others one or two drops effected the purpose. I am convinced that a large proportion of failures in emulsion making arise at this point, as I have never failed in making a clean working emulsion giving clear shadows after attending carefully to this matter. Next replace the now sensitised emulsion, in its jar, in the vessel of boiling water, there to remain boiling for one hour, or longer if greater sensitiveness be required.

In the meanwhile weigh out

Nelson's No. 1 gelatine	60 grains,
Heinrich's gelatine	120 ,,

and, in a second jar, soak this for about three-quarters of an hour in cold water, as much as the jar will hold, then reverse the jar, with a piece of muslin over the top, and drain thoroughly.

When the emulsion has boiled for the specified time, remove it from the boiling water, and replace it by the jar containing the soaked gelatine. Plunge the jar of emulsion into cold water, and keep it there until the gelatine in the second jar is thoroughly liquefied. The vessel of boiling water having been removed from the fire before the jar of gelatine was placed in it, the temperature of both will now be found to be just suitable for mixing.

This must of course be done in the dark room, pouring the emulsion into the gelatine so as to leave behind any coarse precipitate which may have been formed. The process of thorough mixing for some minutes must now be repeated, and the emulsion finished by adding about a drachm of strong ammonia, with constant stirring, when it may be put aside to cool and ripen for a few days.

The washing and remelting may be done, as most convenient, by any usual method. I may mention that in some cases complete precipitation of the gelatino-bromide has taken place when cooling, in the vessel of cold water, after boiling; but as this is not of uniform occurrence, I depend upon the method of washing the finished emulsion. The vessels I employ are ordinary two pound jars, such as are used for Moir's marmalade. When boiling, I close them with a bung in which a groove has been cut, and cover with a tin cap—such as the lid of a canister—to exclude any ray of light, as I do not boil in the dark room. For storing, nothing is better than a stone ink bottle—of course, thoroughly cleansed—and in this the emulsion is remelted for coating, over an ordinary fire, as in boiling.

The idea of employing the two bromides occurred to me on account of having observed that with potassium I got clear shadows, with, possibly, too little detail in them, while the reverse was apt to be the case when ammonium had been employed, and I think the mixture will be found an improvement.

DEAD BLACK VARNISH.

A FORMULA for a dead black for the inside of optical instruments, such as photographic lenses, &c., is often asked for and as often given, in a very loose manner, in many journals devoted to technical matters. A new recipe—evidently one of value for the purpose—has recently been going the rounds of the papers, and may be here given for the benefit of our readers who may desire to make the interior of their lenses resemble their pristine form of black devoid of gloss. Take two grains of lampblack, put it into any smooth, shallow dish, such as a saucer or small butter-plate, add a little gold size, and thoroughly mix the two together. Just enough gold size should be used as will hold the lampblack together: about three drops, of such size as may be had by dipping the point of a lead-pencil about half an inch into the gold size will be found right for the above quantity of lampblack; it should be added a drop at a time, however. After the lampblack and size are thoroughly mixed and worked add twenty-four drops of turpentine, and again mix and work. It is then ready for use. Apply it thin with a camel-hair brush, and when it is dry the articles will have as fine a dead black as when they came from the optician's hands.

HYPOSULPHITE AND ALBUMINATE OF SILVER.

FROM a lecture on the chemistry of photography in relation to silver printing by Mr. E. J. Cox, we extract the following on the two salts named above:—

There is one more reaction with silver chloride worth noting, it was discovered by Sir John Herschel—the reaction with hyposulphite of soda in which the chloride dissolves. This reaction is of incalculable service in the fixing of prints, for if the unaltered silver chloride be allowed to remain in the print it will, upon exposure to light, be converted into the dark subchloride, and the picture will be obliterated, a fact which is well known to all of us. To secure permanency of the print a strong solution is necessary. To understand this, it should be remembered that when silver chloride is added to hyposulphite of soda a mutual exchange takes place between these compounds, and we have instead sodium chloride and a double hyposulphite of silver and sodium. Now there are two kinds of double hyposulphite of silver and sodium—one is nearly insoluble in water, the other exceedingly soluble, and this latter is formed only when the fixing solution is strong.

I now pass to the consideration of the organic salt of silver, namely, that formed between the albumen of the printing paper and the silver nitrate of the sensitising bath, and known as albuminate of silver. Albuminate of silver is formed when we add albumen to silver nitrate. It is a white substance which disappears on addition of hyposulphite of soda and ammonic hydrate, being soluble in those fixing agents. When albuminate of silver is exposed to light it gradually darkens, and it is important to notice that this darkening takes place more rapidly when silver nitrate is in excess, instead of deficient. The compound is now no longer completely soluble in hyposulphite of soda or ammonic hydrate, but is at once soluble in nitric acid, which often dissolves oxides. These facts lead us to the supposition that the result of exposing organic silver salt to light is to reduce the oxide of silver they contain to the condition of suboxide, a process analogous to the reduction of silver chloride to silver subchloride.

It may now be serviceable to compare the silver chloride and albuminate of silver, both of which are present in the paper; each is reduced by light to the state of a subcompound in the presence of silver nitrate. The subchloride of silver is decomposed in fixing, leaving metallic silver, and the image formed on pure chloride is weak and lacking in depth. The combination of reduced oxide of silver with albumen is not entirely destroyed by fixing, and the image is more vigorous.

A SIMPLE INSTANTANEOUS SHUTTER.

In the beginning of the year M. Contadzian presented a very simple and very effective instantaneous shutter made out of a child's colour box. Two cardboard slides are made to cross over each other in order to have a central opening. One of the slides is held down by means of a steel spring; the other slide is attached to the former by a piece of string, which goes over a small wheel on the top of the apparatus. A piece of silk cord is fastened to this slide, and goes through the bottom end of the box. When this cord is pulled the slide comes down and pulls the other up; a catch in the side of the box now holds it. When the catch is loosened the spring pulls one of the slides down and the other up, so that the holes in the slides pass one before the other, and the exposure is made.

REPACKING EXPOSED GELATINE PLATES *EN ROUTE.*

'In the multitude of counsellors there is wisdom,' hence we give the sentiments of divers writers on this topic. Mr. W. Brooks says:—

Last summer I saw a lot of very large negatives spoiled by sheets of *papier* Joseph being placed between each pair of plates. We are told that *papier* Joseph is the purest paper that it is possible to make. When the plates were developed, the structure of the paper was also developed, showing all the parallel lines contained in the paper as plainly as the image itself. I had a lot of plates spoiled in the same way myself; after that I tried the thin tissue paper and thin packing paper, but all these more or less marked the plates, but not so badly as the *papier* Joseph, as there were no parallel lines to show. I also tried thin calendered brown paper, which answered better than any of the other papers tried, but there were certain faults about that which were very objectionable. I have had several letters lately from abroad, saying that it is a very great mistake of English plate makers to send their gelatine dry plates out with paper packed between them, for in many instances they are found to have stuck together, and there is no getting them apart without spoiling the plate entirely.

For a long time past I have been making experiments with various materials for packing plates, which I think successful. I am of opinion that plain paper is bad for the purpose. For successful packing, the material used must be non-absorptive. By way of experiment I perfectly dried some gelatine plates and then placed between them some pieces of *papier* Joseph, and bound them together, and in twenty-four hours I exposed a plate and developed it, when it gave the structure of the paper, and I came to the conclusion that it was caused by the different degrees of humidity of the paper and the gelatine film, the humidity being equalised between the two; other papers also caused markings of a different kind under the same conditions. I then tried rendering the paper non-absorptive by passing it through a thin alcoholic solution of shellac, using thin brown paper for the purpose, and then passing it through a rolling press, with good pressure to flatten it; this I found a great improvement—after plates being bound tightly together for a whole week, on developing no marking occurred.

I have tried various other substances successfully, namely, tin foil, lead foil, thin sheet guttapercha—the latter seemed to answer the purpose better than any other material, being perfectly non-absorptive of moisture, and I should say perfectly inert to the most sensitive of films; it can be purchased at the chemists' sundrymen, or at the guttapercha warehouses in almost any large town, and can be used over and over again. I do not for a moment suppose that plate makers would adopt this mode of packing, but for photographers, both amateur and professional, it will be of great service, for, as a rule, plates *en route* are changed at night in the bedroom with but very little accommodation, and whatever method may be adopted it must be expeditious. In summer time (dry weather) thin sheet gelatine can be used, such as used for bonbons, without any colour—using gelatine is going to the other extreme, as it absorbs moisture with a vengeance; but I have found it answer, but give the preference to either the guttapercha tissue or the shellac paper. I always prefer to cut whichever material I use as near the size of the plate as possible. With care I have packed many plates with nothing between them without any damage occurring, but have kept them entirely under my own charge. The sheets can be carried in a flat tin box or a small portfolio of the size, or between two thick pieces of cardboard.

On the other hand Mr. Pringle says:—

Mr. Brooks's experience and mine differ greatly in the matter of plates packed with paper between them, and, as a matter of safety, I should very much doubt the advisability of either rubber or varnish as materials for separating plates. In the first place, I have used several kinds of paper between the faces of sensitive plates, and I have carried these plates many thousands of miles, and so long as the paper was as large as the plates I could never tell that there had been paper between them, except in one or two cases when the plates had not been thoroughly dry when packed. I believe this to be the key to the whole puzzle of contradictory statements made on this subject. If the plates are really dry and the paper also, I do not see why any markings should arise. And the paper ought probably to be kept in darkness previous to being used for this purpose. I understand that paper has a certain amount of phosphorescence, or fluorescence, or perhaps 'od,' that may affect a plate as described by Mr. Brooks and several others. All I can say is, that paper *need* not affect the plates. But I rather fancy the best way of all is *not* to put *anything* between the faces of the plates. If no grit be present, nor dust, and if the plates are not allowed to move across the surfaces of each other, I cannot conceive any danger, nor any better way of packing them than face to face in contact. But again, they must of course be 'bone dry.' I should be very much afraid to take Mr. Brooks's varnished separating papers into a very hot, moist climate, and I should almost equally fear the rubber. But I cannot speak from experience on the point; Mr. Brooks usually knows what is what, If the tourist will get from Mr. Hare or Mr. Rouch a box made to a design of mine, and will pack his plates face to face in the box, I will guarantee the safety of the plates and the convenience, ease, and simplicity of the whole packing operation. You liked my box yourself, Mr. Editor, and every practical man who has seen it likes it, I believe, and I can recommend it fearlessly, for I have no interest in the sale of it.

CLEARING NEGATIVES.

A COMMUNICATION was made to the Photographic Society of France on the disadvantage of employing hydrochloric acid to dissolve out oxalate of lime from gelatino-bromide plates after development and fixing. The author of the communication recommended the following as giving the best results. He says ordinary water can be used for the developing solutions, washing, &c., if after the negative is fixed and well washed it be plunged a short time into the following solution :—

Water	100 parts.
Oxalate of iron	2 ,,
Alum	8 ,,

The opalescence will be completely cleared, and the whites of the negative will remain transparent. Specimen plates, of which the half had undergone this treatment, were handed round, and bore testimony to the value of the process employed.

BICHROMATE POISONING.

THE danger of bichromate poisoning does not necessarily arise only from local absorption or irritation ; there is no reason for doubting that the salt may pass into the system and so cause a general derangement, the effects of which are only locally manifested. Dr. Jubb has been making a series of experiments upon absorption through the cuticle of the human subject, and the results he has obtained are a very valuable contribution to scientific medicine. He used ferrocyanide of potassium, iodide of potassium, and a number of non-photographic chemicals, submitting the skin, previously well washed with soap and water, to the action of the spray of a solution of the various substances ; the superfluous fluid was then wiped away, the limb rubbed with fat, and a bandage placed upon the spot acted upon. In every instance it was conclusively shown that the salts had passed into the system, for upon examination of the urine passed after the experiment they were invariably found present in greater or less quantity.

CHLORIDE OF GOLD.

DR. P. H. MASON says :—

The method that I have found best during the past season to obtain a solution of chloride of gold that is reliable has been as follows :—Taking a two and a half dollar gold coin, or its equivalent in dental gold, which is about fifty-six grains of the pure article, cut it up and add, in a porcelain dish, three ounces of a mixture composed of three parts nitric and five parts muriatic acid. By heating on a water bath the chemical action takes place more rapidly. I say 'on a water bath,' because a higher degree of heat than that of boiling water is uncertain, and is apt to change the auric chloride into aurous chloride, a compound not wanted, and one that is insoluble in water. Evaporate the solution to a half ounce, or to crystallisation if you choose, then add warm water to the extent of eighteen ounces. You will now have an acid solution of chloride of gold that will keep, if not used, for a lifetime, and will represent on a rough calculation about three grains of pure chloride to the ounce.

Neutralising this gold for toning purposes is best done, just before use, by adding to the quantity desired to make up the toning bath (my experience is that one-half a grain of this gold to a sheet of paper is quite sufficient) enough of a saturated solution of bicarbonate of soda to turn red litmus paper faintly blue. This neutralisation should be done very carefully, giving time between the drops for the soda to thoroughly permeate the solution of gold before testing it.

TASTE IN THE SHAPE OF LANTERN SLIDES.

'FREE LANCE' says :—I can fully sympathise with those gentlemen who cannot be satisfied with the regulation shapes of magic lantern slides ; but, except for those amateurs who make for their own pleasure, I do not see a remedy, and photographers have only themselves to blame. They used to be so particularly fond of printing-in the whole of the contents of their negatives, irrespective of its artistic propriety—to leave out the most obtrusive of foregrounds, or the most inartistic of corners, would be sheer waste ; they had gone to the trouble of taking them, using for the special purpose a lens such as few possessed, a likely thing, indeed, they were going to leave it out. The result is seen everywhere ; scrap views are cut to regulation sizes, so that the public can get plenty for their money, and artistic selection goes to the wall. Let, however, the amateurs set an example, and not have their tastes governed by trade canons, and in time their example will be followed, and slides may be bought giving the best, and not the most, for the money.

GELDMACHER'S METHOD OF PREPARING COLLODIO-CHLORIDE.

A PLAIN collodion is prepared with equal parts of ether and alcohol and from two to three per cent. of pyroxyline. With a thin collodion it is easier to obtain a coating of even thickness upon the paper than with thick collodion ; it must, however, not be poured off so soon as the latter. If the film is unequally thin, either from too thick a collodion or from unevenness of the paper, different tones will be seen in the picture, as the thicker places will appear less toned and the thinner ones more so. An old collodion which has been standing some time is to be preferred to one newly prepared—it is more perfectly combined and cleaner ; at the same time it must be most carefully poured off from any sediment that has been deposited. A little castor oil is added—not more, however, than half per cent.—otherwise the high glaze of the picture is injured, and the toning made difficult.

In a small glass put two hundred grains of nitrate of silver and three and a half drachms of water ; when the silver is dissolved, nine drachms of alcohol are to be slowly added. Fifty grains of citric acid are also dissolved in an ounce and a half of alcohol, and fifty grains of chloride of strontium in another ounce and a half of alcohol.

Instead of chloride of strontium, other chlorine compounds may be employed ; but one will do well to keep to that one that produces results most to the taste of the individual. Chloride of calcium prints too blue, so that it is impossible to properly control the toning ; one must then work according to time rather than by sight, and that is always a delicate thing to do, for the temperature of the air, the water, and the solutions, is not always the same. Chloride of ammonium prints of a reddish colour, and the toning bath will not work so well ; it appears to have a retarding action on the toning. It also appeared to me that the different chlorides give different grades of sensitiveness to light : with chloride of calcium the printing is quicker than with chloride of strontium ; but, for the reasons given, I prefer the latter. Chloride of strontium, especially on paper prepared with gelatine and baryta, prints of a rich red, and the action of the gold bath is very easily observed. The chloride of silver collodion which I prepared commercially contained chloride of strontium.

When the ingredients mentioned are perfectly dissolved, the citric acid is added to the solution of chloride of strontium, and this solution mixed with fourteen drachms of plain collodion, little by little and with shaking or stirring. When thoroughly mixed the silver solution is added to the collodion in a yellow light, very slowly and with much stirring. It sometimes happens that after the addition of the alcohol to the silver solution, some of the salt crystallises out; the glass vessel must in that case be placed in warm water until the silver is redissolved, when it must be mixed with the collodion without loss of time. The collodion emulsion must then be repeatedly and thoroughly shaken, and after standing for an hour is ready to be applied to the paper.

The filtering of such an emulsion is a tedious process, since the filter becomes so quickly choked; silvering can, however, be dispensed with by always decanting with the greatest care the plain collodion from its sediment. The remaining three solutions may be easily filtered through paper.

When such a collodion remains standing for a long time, a fine deposit of chloride of silver separates and the collodion is unequal; in this case it is necessary to shake it up again.

IMPROVED GUM WATER.

The convenience of a 'bottle of gum water' is too well known to need comment; but it is, as a rule—to employ popular phraseology—'not sticky enough,' and it possesses the further disagreeable property of producing a greasy-looking stain or blot when used with paper from which the size has been removed. All these and other disagreeable properties are removed by a very simple method—the addition of sulphate of alumina to the mucilage. The formula runs—two grammes of crystallised sulphate of alumina dissolved in twenty of water is added to two hundred and fifty grammes of gum arabic solution (two to five strength), though, for our own part, we should prefer a stronger solution—half a pound of gum to a pound of water is ordinarily a good useful strength for adhesive purposes.

THE AMERICAN STANDARD DEVELOPER.

The formula for the American standard developer is—

Ferricyanide potass (yellow prussiate)	3 ounces, 437½ grains each.
Carbonate soda (washing soda)	3 ,, ,,
Pure carbonate potass	3 ,, ,,
Water	29½ ounces.

Above solution two drachms, water two ounces, pyro four grains.

A CAMERA WITH A FINDER.

The description given by M. Marc Ferrez of his finder shows that much ingenuity has been displayed in its construction. Addressing the French Photographic Society, he says:—

'Here is my large camera, which you can see is not very portable. On the top, exactly in the centre and over the focussing glass, I have adapted a small ordinary wooden camera, with a wooden slide or box instead of bellows carrying a small lens; this camera is about four inches square. To the bottom of my large camera I have attached, as you see, a connecting rod, which is elbowed and fixed to the front of the camera. This connecting rod then turns at right angles, and terminates by a screw. Upon this screw works up and down a swivel universal nut, to which is fixed a brass rod going direct to the small camera. This brass rod is itself in two parts, working or sliding into each other telescope fashion; this in-and-out motion is regulated by a hand nut. The apparatus is worked in this wise: The object is focussed on the ground-glass of the large camera, and the nut is then loosened and the sliding brass rods set free; the small camera is now focussed on the same object. When it coincides with the image upon the ground-glass of the large camera the nut is tightened. The large camera may now be focussed; it acts in conjunction with the small one. Suppose a ship is one hundred yards from the photographer, and it has been focussed at that distance; if, during the time that the operator arranged his dark slide and centred his image, the ship had made progress and got a little out of focus, this can be seen on the ground-glass of the little camera. The focussing screw of the large camera sets the whole to rights, because when the bellows of the large camera goes in, the apparatus causes the little camera to do the same, but upon a smaller scale.'

PERMANENT SOLUTION OF IODIDE OF STARCH.

THE use of iodide of starch puts into our power one of the most sensitive reagents known to chemists; by its means the merest trace of hypo can be shown. As, however, starch solution does not keep well, the photographer unaccustomed to analytical operations does not care to trouble himself with its preparation, and so, usually, does not care to test for suspected hypo, as he might do if he had a bottle of reagent always at hand. A method has lately been described, by means of which a permanent solution of starch potassium iodide can be kept ready. Five parts of starch ground up with about fifty of water are well shaken up in a flask, and, next, about twenty-five parts of a solution of potash (one part potash to two of water) added. The whole is well shaken, and it then forms a gelatinous mass. Five hundred parts of water are now added and two of potassium iodide, and the whole is heated to boiling, shaking frequently, when the solution becomes clear. The liquid is then allowed to cool, and is finally filtered.

CRYSTAL MIRROR PHOTOGRAPHS.

AT a meeting of the Glasgow Photographic Association Mr. Dalglish showed a number of his 'new crystal mirror photographs,' which were greatly admired. In this adaptation the photograph, a plain, unmounted print, is fastened to the back of the glass and the background being eaten away, thus making the figure stand out in relief. The silvering compound is then applied to the glass, and as the photograph appears in the mirror, a very realistic effect is produced. When the glass is bevelled, and the whole fixed in a plush frame, it makes a very effective picture. He said that it was with the view of ship decorating that he had introduced these photographs; they being protected by a special waterproof varnish which did not allow of damp injuring them at all.

TONING BATH FOR LIESEGANG'S ARISTO (GELATINO-CHLORIDE) PAPER.

THE prints having been thoroughly washed, they are ready for the toning bath. One of the most reliable and satisfactory is the following bath, composed of two solutions :—

A.

Water	3 ounces.
Chloride of gold	2 grains.

B.

Water	3 ounces.
Sulphocyanide of ammonium	40 grains.
Hyposulphite of soda	1 grain.
Carbonate of soda	3 grains.

Which are mixed together by one part of A being poured into an equal part of B; in no case the reverse.

With the *right* hand take the prints from the washing dish and submerge them one by one in the toning solution. Each print must be thoroughly and evenly wetted and kept in motion, or unequal toning will be the result. A large number of prints should not be toned at the same time, as care must be bestowed upon each print. On immersion in the gold bath the prints will turn quite yellow, which changes immediately into a brown, and then into a purplish-brown hue. As soon as the last-mentioned colour is assumed, they should be taken out and placed at once by the *left* hand (which must on no account come into contact with the toning bath) into the fixing bath without washing.

MECHANICAL ADDENDA TO THE LANTERN.

[THE PANDISCOPE OR LANTERN SKETCHER, AND THE 'PRESTO' PHOTOGRAPHIC SLIDE CARRIER.

HAVING witnessed what may be well deemed a rather unusual phenomenon in connexion with the lantern, the tracing of the outline of a well-known photograph in luminous lines on a previously dark screen, we purpose describing the same. Unless we had witnessed it we could not, from a mere verbal or written description, have realised the sensational effect capable of being produced by this 'handwriting on the wall.'

The special piece of apparatus by which this rather startling result is achieved is made by Mr. W. C. Hughes, of Brewster House, Mortimer Road, N. It consists of a wooden frame capable of fitting easily into the slide receptacle of any ordinary lantern of the average size. But instead of the usual transparency, a square of plain blackened glass is inserted into the slide, so that when the lens is uncapped and the light full on nothing whatever is seen on the screen. But presently bright, luminous lines are observed, traced by some unseen limner and by an agency which cannot be discovered; and speedily the outlines of a picture, landscape, or portrait, cover the whole space on the screen. The figure, picture, portrait, or writing, unfolds itself before the spectators with the same exactness and precision as though it were performed by a pencil upon paper.

By aid of the following diagrams the mechanical agency by which this surprising effect is produced will be plainly understood. Fig. 1 represents the frame or slide, the right-hand end of which is inserted in the lantern, the black disc being central with the condenser. At the opposite end is affixed a lamp, the light from which serves to illuminate any small photograph or print which is pressed against a plate of glass. This lamp being carefully covered, no light from it is seen by the spectators in front. A small handle, to which is attached

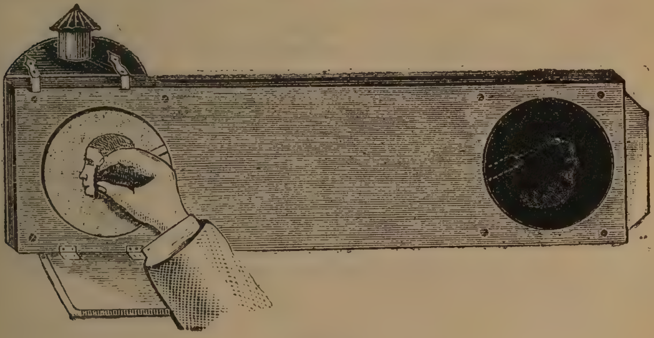


FIG. 1.

a tracing point, is grasped by the right hand of the exhibitor, and is moved so as to guide the point of the tracer over the drawing, with this result—that every touch made by the hand is reproduced at the other end by a needle point which moves over the blackened glass. When the tracer is lifted from the drawing the needle point is also removed from the blackened glass.

The means by which this is effected is shown in Fig. 2, which represents the opposite side of the slide, and shows the back of the lamp and the combination levers, by which each touch of the tracer is repeated at the opposite end. This reproduction is upside down, as, of course, it ought to be in order to its non-inversion on the screen.

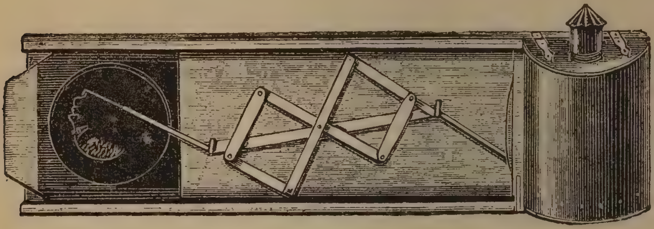
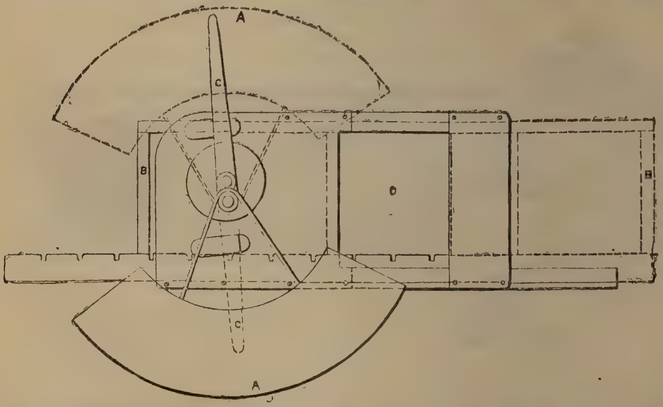


FIG. 2.

Of the various ways by which the glasses can be blackened, probably the quickest and best is to ignite a small piece of camphor and hold the glass plate over it.

While on the subject of lantern *addenda* we may allude to the method adopted by Mr. Hughes for effecting the change from one slide to another without any movement being observed on the screen. This, like the *Pandiscope*, consists of a slide frame, D, capable of being inserted into any lantern of the ordinary size. It receives a double runner or holder, B, capable of receiving two transparencies. The aperture, D, is in the axis of the optical system. It



should be premised that the shutter, A, shown at the bottom of the diagram, is formed of a thin sheet of ebonite, and is several inches in front of the slide, being capable of such adjustment as to cause it to rotate in front of the lens or objective of the lantern.

By taking hold of a handle and rotating it the shutter acts as a cap to the lens, and cuts off the light from the screen, which is no sooner effected than certain teeth which project from a circular plate (not shown in the diagram) act in notches in a tailpiece of the running plate holder, and cause it to move horizontally the full distance requisite for it to travel in order to bring the second transparency in the axis of the condenser, when, by continuing the rotating motion of the shutter, the lens is uncapped and the new picture is seen on the screen, the change having been effected during the moment of darkness caused by the passage of the shutter over the lens. This shutter at each change assumes the positions shown at A and A respectively, above and below the slide.

The change from one picture to another takes place with any degree of rapidity desired, and with the most perfect smoothness of action. During the time the picture is shown on the screen the running slide holder is locked by a catch which falls into one of the notches, and it can only be released by rotating the shutter or screen.

Mr. Hughes designates this his '*Presto' Instantaneous Photographic Slide Carrier,* and in action it quite bears out all that is implied in the name selected.

HARMONIOUS DISPOSITION OF LIGHT AND SHADE.

There are, says Mr. Hugh Brebner, a few fundamental rules which regulate the harmonious disposition of pictorial light and shade, and from which no successful departure is possible. These are so absolute and apparent that I may state them as axioms.

Axiom 1. The general scheme of light and shade must be simple.

Axiom 2. The point (or region) of greatest interest shall be the point (or region) of greatest intensity, or of contrast.

Axiom 3. All other contrasts must not only be subordinate to this, but shall tend to give it value or prominence.

Axiom 4. The transition from light to shade, and *vice versâ,* shall be gradual.

Axiom 5. In all good design there shall exist a more or less fixed proportion between the two extremes and their means, the latter as a rule preponderating quantitatively.

HYDROKINONE.

The formula last published by Mr. Ingall is as follows :—

A.

Carbonate of potash (commercial)	1 ounce.
Water, not hard	4 ounces.

Filter this once through a piece of cotton wool wrapped in muslin and pushed into the neck of the funnel. I find it is the grey German filtering-paper that has given the straw colour to my filtered potash. With cotton wool it comes through quite colourless.

When filtered, add salicylic acid, five grains.

B.

Hydrokinone	20 grains.
Pure methylated spirit	$1\frac{3}{4}$ ounces.
Glycerine	$\frac{1}{4}$ ounce.

I find this keeps any length of time, and although it may slightly discolour it does not deteriorate. The proportion for use is A 2 + B 1 + water 16.

After fixing thoroughly, put the plate into saturated solution of alum for ten minutes; then, after a thorough wash and draining to last drop, into methylated spirit for five minutes, keeping the spirit moving over the face of the plate. This, you can distinctly see, has a clearing, brightening effect. The plate, when thoroughly drained from the spirit, may safely be dried right off over a petroleum lamp, with a copper cap on the chimney, keeping the plate moving. Three or four minutes at outside will completely dry it. I think there is one great advantage in using methylated spirit in the developer. It was, I believe, originally recommended to cause the developer to flow easily; but seeing the powerful effect it has, by instantly causing any frill or blister on the plate to entirely disappear, and also the marked effect it has in clearing and brightening the picture, I suppose it must exert these influences during the development, although it is not possible to perceive it then. The salicylic acid gives blacker tones than the tartaric. The colourless potash becomes straw colour on addition of the acid.

THE DEVELOPMENT OF THIÉBAUT'S PELLICULAR CARDS.

Making a departure from the directions given by the maker of these pellicles, Messrs. Ince and Addenbrooke proceeded as follows:—

'After exposure we placed the card in an ordinary pyrogallic developer made up with sulphite of soda (four grains of sulphite to one of pyro), neutralised with citric acid, the ammonia solution being made up of one ounce of ammonia to two ounces of water, with seventy-five grains of bromide added, or practically one-sixth proportion of bromide to ammonia. The development proceeds slowly but with great regularity, and the shadows remain remarkably clean; it is necessary to exercise patience in development if density is required, and to bear in mind the fact that the picture by reflected light looks very much denser than it turns out to be when detached; judgment in this respect is not difficult, but a few trials will be necessary to ensure success. It must be remembered that the opacity of the card support absolutely prevents any examination of the film by transmitted light. After development and well rinsing in water, we placed the card, with the film thereon, in a saturated solution of alum, made by dissolving ordinary powdered alum in boiling water, and then allowing the solution to cool. After leaving the card with the emulsion still on in the alum bath for ten or fifteen minutes, we thoroughly rinsed the card again and washed in two or three changes of water, and we then placed the negative in the fixing solution, face downwards, as the cardboard has a tendency to float and to curl up diagonally, leaving the two opposite corners uncovered by the solution. We used the ordinary hypo solution, with a little chloride of gold added (one grain); the fixing proceeded very slowly, and it was not safe to remove the card from the fixing solution for half an hour. On removal from the hypo we stripped the film from its card support. This was easily done by passing a knife under one corner of the film, when with care it was easily detached by steadily pulling it. Even in this wet state, as first detached from the card support, the film is very tough, and can be handled without fear of tearing. After detachment, the film immediately enlarges by about one-fourth in length and breadth. After thus detaching, we placed the film immediately in water to get rid of the hypo; this we found washed out more rapidly than in the case of a plate, as the water was able to get at both sides of the film at once. After washing, the film was placed in methylated spirit for about fifteen minutes. During this process the film contracts, and is reduced to about its original size. On taking the film out of the spirit, we carefully placed it on a sheet of ebonite, taking up what moisture we could with a sheet of clean blotting-paper, passing the hand over this with a gentle pressure, so as to leave the film on the ebonite quite flat and free from air bubbles. The film was then left to dry spontaneously, and when dry, was stripped off the ebonite in the same way as it had been before stripped off the cardboard support, the result being that the negatives and transparencies were left in a perfectly flat condition.'

GELATINE EMULSION FOR OPALS AND TRANSPARENCIES WITHOUT DEVELOPMENT.

ADDRESSING the Edinburgh Photographic Society, Mr. F. Briglmen says :—

By this method I work in daylight and comfort. I begin by simply turning the ordinary Venetian blinds of my room so that the light is projected upwards; when so turned they give me plenty of light to work with comfortably.

I next make my emulsion as follows :—

Gelatine	¼ ounce.
Chloride of ammonium	20 grains.
Citrate of potash	40 ,,
Water	5 ounces.
Nitrate of silver	¼ ounce.

The gelatine, chloride of ammonium, citrate of potash, and water, are put into a bottle capable of holding upwards of three times the quantity, and allowed to soak until the gelatine is thoroughly swollen, then well shaken up, and the silver added in crystals, and shaken again, till all the silver nitrate is dissolved. Keep at a temperature of about 100° Fahr. for an hour, and let cool down to between 80° and 90° Fahr. Now add twelve ounces of spirit (methylated will do), and shake well. The emulsion will be deposited in a pasty mass. Let it stand for an hour or so (don't expose to light more than is necessary), and pour off the fluid. Add three or four ounces more of spirit, and shake well to extract all the water, pour off the remaining spirit as much as possible, and your emulsion is washed. Add five ounces of water, let soak and dissolve. Filter through chamois leather, and proceed to coat your plates, giving a good thick coating.

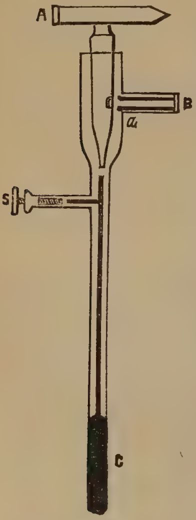
When your plates are printed, treat them in the same way as in washing, toning, and fixing prints. The toning is slow to start, but when started proceeds rather rapidly; any tone, from a brick red to a cold, slaty black can be got. This emulsion makes capital opals, but in coating for opals coat as thinly as possible. After my plates are coated, I stand four tumblers round my levelled plate (which is large enough to allow of a number of plates being on it at once), and spread a sheet of brown paper over the plates and tumblers, with the ends hanging down, and leave them there till dry, which they will be in a few hours in good weather.'

THE AUTOMATIC REGULATION OF TEMPERATURE.

THERE are numerous operations in connexion with photography, as well as chemistry, in which it is requisite to retain an unvarying temperature for an indefinite, or at any rate a lengthened, period, without the trouble of constant attention—such, for instance, as the 'cooking' of an emulsion, or, which is scarcely less important where absolute uniformity is required, the keeping it at a constant temperature during coating.

For the purpose indicated, it is customary to employ an instrument termed a thermostat or thermo-regulator, which, being sensitive to the slightest changes of temperature, regulates, by means generally of a rising and falling column of mercury, the supply of gas or other fuel by which the temperature is maintained.

The general principle is, as we have stated, a sort of thermometer connected with the gas supply in such a manner that as the temperature rises it cuts off the supply, and *vice versâ ;* the result of which is that as the temperature tends to fluctuate, a corresponding fluctuation in the heat supply takes place in the contrary direction, so that practically a state of equilibrium is maintained. The most perfect we have yet seen is the thermo-regulator of Professor Reichert, of Freiburg. The hollow glass stopper, A, is accurately ground into the upper portion of the thermometer tube, C, the bulb of which is large in proportion to its bore. The gas passes in the direction of the arrow at A down the interior of the stopper, and passes into the hollow chamber formed in the thicker part of the tube, whence it escapes by the side branch, B. The point of the stopper reaches to the bottom of this hollow chamber, where the narrow column of mercury finishes, and it is obvious that, as the mercury is forced by expansion into the chamber, it closes the aperture and shuts off the supply of gas, except so much as escapes through a minute opening drilled in the stopper at *a*. To use the instrument, the end, A, of the stopper is connected with the gas supply, and B with the Bunsen or other burner which forms the source of heat. The mercury tube is passed through the cork of the flask, or otherwise immersed in the vessel or liquid to be maintained at any fixed temperature, and, being connected as described, the gas is lighted; as the temperature rises the mercury rises also, and when, on testing with the thermometer, the required point is reached, cautiously turn the screw, S, which forces the mercury up in the tube until the gas suddenly goes down to the mere speck from the 'bye-pass' at *a*. The exact temperature will perhaps not be hit within a degree or two at the outset, but after a few minutes, in which the contents of the vessel or boiler will become evenly heated, the precise temperature may be adjusted to the fraction of a degree, and will remain at that adjustment so long as the screw is not altered.



With very small vessels or small quantities of fluid it may be difficult to keep the heat down to so moderate a point as 90° or 100° Fahr., owing to the quantity of gas passing the 'bye-pass' being sufficient to maintain a higher temperature. In such a case, either the flame must be placed at a greater distance from the boiler, or the minute hole partially filled with paraffine wax. Another caution may be given, namely, that an atmospheric burner of many jets, or the 'solid flame' form, is not suitable, as the quantity of gas passed through the small orifice will not suffice to keep them alight; and it must always be borne in mind with any of these instruments, that if the flame be once extinguished the gas is in a very short time turned on to the full, owing to the fall of temperature, and the instrument then becomes a serious source of danger. For this reason the gas should never be turned off at the meter while the instrument is at work.—THE BRITISH JOURNAL OF PHOTOGRAPHY.

EDER'S OXALATE DEVELOPER.

Neutral oxalate of potash	2 ounces.
Sulphate of iron	6 drachms.
Water	3½ ounces.

Neutral oxalate of potash is dissolved in boiling water, and this solution is kept at a temperature between 194° and 203° Fahr., while sulphate of iron is dissolved in it. It is then set aside for twenty-four hours, and the clear liquid decanted off the crystals that have formed at the bottle, and is ready for use. He says that it is the most energetic developer for gelatino-bromide plates.

SODA, POTASH, AND AMMONIA DEVELOPER.

Dr. Martell recommends the following developer :—

1.

Pyro	1 drachm.
Citric acid	5 grains.
Sulphite of soda	1 drachm.
Water	10 ounces.

2.

Carbonate of potash	1 ounce.
Water	20 ounces.

3.

Bromide of ammonium	2 scruples.
Liquor ammoniæ fort.	1 drachm.
Rain water	20 ounces.

For development mix equal parts of 1, 2, and 3 : in cold weather a little more of 3 may be used.

He sums up the advantages which accrue from its use :—1st. Greater rapidity in development than when soda and potash are used alone or in combination. 2nd. Comparative freedom from the yellow tinge caused by soda. 3rd. Greater density than can be obtained by ammonia alone. 4th. Greater detail than can be got by soda alone.

NEW PRINTING PROCESS.

A new method of printing has been invented by B. B. West and B. C. West, of Guilford, Conn., U.S.A. To produce the best results the paper is first coated upon both sides with a starch solution. The sensitising solution is prepared from the following formula :—Potassium bichromate, two parts ; mercuric chloride, one part. For the bath, take pure water, and to each ounce add fifty grains of the above-mentioned compound, and thoroughly dissolve the same. The paper is immersed in the bath so as to wet both sides of it for a period not exceeding one minute. The paper is dried by artificial heat, and should be used the same day to secure the best results, but it may be kept for several days in a dark, cool, damp place. After the paper has been properly dried it is printed upon by exposure to light under a negative, in the usual manner. After washing the prints in clear water, they are subjected to a developing bath, composed of a solution of pyrogallol, two parts ; gallic acid, eight parts ; ferrous sulphate (dried), or other ferrous salt soluble in water, ten parts ; sodium hyposulphite (dried), eighty parts, dissolving the compound in water in the proportion of two per cent. of the compound to the water. By employing the pyrogallol in the solution, the colour which is produced may be changed to a brown or any intermediate shade, by subjecting the prints to a toning bath containing lead nitrate. Without the pyrogallol a violet-black is produced by an aqueous solution of the three other ingredients, but the colour is not subject to change in the toning bath. The ferrous salt referred to is preferably ferrous sulphate, but ferrous tartrate is sometimes used. The print should be left in the developing bath from five to ten minutes, and then removed from the bath, then washed in clear water. It may then be bleached by the action of a dilute solution of chlorine or bromine ; the bleaching action of the halogens should be modified by the presence of an acid, as it is then more even. The chlorine bath is best prepared by dissolving one part of calcium-hypochlorite in three hundred parts of water, and adding about two parts of an acid, preferably phosphoric acid. After the prints have been bleached, they may be mounted in the usual manner, or, if a brown colour is desirable, they are toned by subjecting them to a bath consisting of a one or two per cent. solution of lead nitrate, or a mixture of potassium, or sodium nitrite and lead nitrate ; but should a cold grey be preferred to the brown from two to five per cent. of mercuric chloride is added to the toning bath. The prints are then washed. To obtain the best results, the paper should possess a considerable degree of porosity, and be thickly coated with starch on both sides of the paper, and the paper should be free from alkaline particles.

MAX BŒLTE'S DEVELOPER.

A.

Distilled boiling water	500
Sulphite soda	100
Citric acid	8
Pyro	15

B.

Distilled boiling water	500
Carbonate soda	25
Carbonate potash	25

To develope, take of A, one part; B, one part; water, one part.

GELATINO-CHLORIDE EMULSION FOR AMATEURS.

THE following is the Rev. H. J. Palmer's method of preparing emulsion for transparencies. He says:—

'We will suppose that the object is to make three ounces of emulsion, and accordingly I place in the beaker of an infants' food-warming machine seventy-five grains of gelatine and sixty grains of common salt, pouring over the gelatine and salt two ounces of spring water. We will imagine this to be done at night, and will leave the gelatine to swell till the following morning. Before going to bed I weigh out ninety grains of nitrate of silver, place it in a cup and pour upon it one ounce of spring water. Next morning, early, the two cups are placed together in hot water, until the gelatine is melted, and the silver solution is made comfortably warm. The saline gelatine solution is poured into a warm stone bottle, is taken into the dark room, and the silver is added little by little, with a good shaking after each dose. Then the bottle is corked, a bit of red flannel tied safely over the cork, and the emulsion is taken to the kitchen and left in a corner of the fender to cook till the evening. The two essentials of the whole proceeding are—not to allow the temperature to rise above 100°, for this means almost inevitably red fog; and, of course, that the cork be not withdrawn and light admitted into the bottle. Tie up your cork of emulsion bottle as you best can, and get your friend to shake the bottle at intervals during the day. If your emulsion has been made at nine in the morning, let it cook at the fire for twelve hours, and then at nine at night take the bottle to the cold-water tap, and, rolling it round under the stream in a horizontal position, in a few minutes the gelatine will have set in a thin film around the upper surface of the bottle. When this is so, fill it overnight with cold water, and leave it till morning for the soluble salts to dissolve. Change the cold water two or three times before you leave home, and drain your emulsion by leaving the bottle upside down in the sink of your dark room until you are ready for plate coating. The *desiderata* now are—clean plates, a strip of glass accurately levelled, a plate holder, and a cupboard or box in which to place the plates till dry. Nothing can be better as a convenient vessel for holding the emulsion when coating plates than an ordinary infants' food warmer; but any glass or earthenware vessel with a lip will do, provided it can be placed, when not in the hand, in a larger vessel of warm water. The stone bottle of emulsion is put into hot water at about 100°, until all the gelatine has melted. The emulsion is then filtered through flannel into the coating cup, and is poured into a pool in the centre of a plate. The larger this pool is allowed to be the easier will be the operation of flowing the emulsion into each corner of the plate. Draining must not be carried too far, and the plate is placed upon the level until the film is set, when it is transferred to the drying cupboard until it is ready for exposure. With our three ounces of chloride of silver emulsion we shall be able to coat three dozen plates of the small lantern size.

'A plate prepared in accordance with these directions will require two seconds' exposure to diffused daylight under a negative of medium density, and should be developed with Edwards's or Cowan's developers.'

SULPHOCYANIDE TONING BATH.

RICH warm tones can be obtained by the following :—

Chloride of gold	1 grain.
Sulphocyanide of ammonium	20 grains.
Water	2 ounces.

TONING BATH FOR GELATINO-SILVER CHLORIDE PAPER.

AFTER soaking in water for two minutes, transfer to a bath composed as follows :—

A.	
Sulphocyanide of ammonium	5 drachms.
Hyposulphite of soda	15 ,,
Water	35 ounces.
B.	
Chloride of gold	15 grains.
Water	15 drachms.

To use, mix one hundred parts of A with seven parts of B, and add fifty parts of water. Strengthen as required by adding more of B.

ISOCHROMATIC PHOTOGRAPHY.

SPEAKING of the results of some experiments in colour-sensitive processes, Mr. F. E. Ives says :—Nearly a year ago I recommended that chlorophyl and eosine be used together in practical isochromatic photography, and this experiment proves that the combination possesses the advantages which I claimed for it. I have found that, in order to secure the best results with the chlorophyl-eosine process, fresh, strong, blue-myrtle chlorophyl solution must be used, and the amount of eosine must be strictly limited; otherwise, the plate will not be so sensitive to yellow and to blue-green. I now prefer to apply the eosine by simply tinting with it water in which the plate is to be washed, after applying a plain solution of chlorophyl. I have an over-exposed negative of a bright chromo card, which I made on one of these chlorophyl-eosine plates, with an exposure of one minute in the light of a coal-oil lamp having a single, small Argand burner and nickel reflector. No colour screen was used, but, owing to the yellowness of the coal-oil flame, all the colours have photographed correctly. An unstained plate, with same exposure and development, showed only the high lights of the picture very faintly.

STRIPPING FILMS.

THE Eastman American stripping film has made excellent progress during the year. It consists of a film of *insoluble* sensitive gelatine emulsion, attached to a paper support by means of a layer of plain *soluble* gelatine. The paper serves as a temporary support during the operation of exposure, development, fixing, and washing, after which the film is laid face down on a prepared sheet of glass and the paper removed by warm water, which dissolves the soluble layer and leaves the image-bearing film on the glass. The paper is then replaced by a prepared sheet of gelatine called a 'stripping skin,' and the whole stripped when dry from the glass. This process gives a clear, transparent, flexible negative of superior printing quality, having all the advantages of glass without its fragility, and about one-fiftieth of its weight. The negatives print equally well from either side, thus lending themselves perfectly to the carbon, zincographic, and photo-mechanical processes. Transparencies for reproductive purposes, or for window ornamentation, are produced with great ease and beauty by contact in an ordinary pressure frame. The American film requires one-third or one-half the quantity of developer required by a glass plate of the same size, and may be mailed by post to any part of the world. The several operations are simple and sure, and follow each other in such order that no time is lost, finished negatives varnished on both sides being produced in from five to eight hours quicker than by the ordinary dry-plate process. The Eastman Company supply their stripping films in rolls for use in their roller slides and in cut sheets for use in ordinary double backs.

RANGE OF FOCUS FOR DETECTIVE CAMERA LENSES.

The following useful table was compiled two years ago by a small Committee on Lenses, appointed by the Society of Photographic Amateurs of New York :—

To those members of the Society who are using detective cameras, or taking 'snap' shots with other cameras, the following table will be of use, showing the number of feet beyond which everything is in focus when the equivalent focus of the lens is used. The disc of confusion is less than one one-hundredth of an inch.

Table showing the number of feet beyond which everything is in focus, when 'f,' the equivalent focus of lens, is used :—

Equivalent focus equals.	Stop. $\frac{f}{5}$	Stop. $\frac{f}{10}$	$\frac{f}{15}$	$\frac{f}{20}$	$\frac{f}{25}$	$\frac{f}{30}$	$\frac{f}{40}$	$\frac{f}{50}$	$\frac{f}{60}$
2 inches	7	3½	2¼	2	1½	1¼	1	⅞	¾
2½ "	10½	5½	3½	3	2⅓	2	1½	1¼	1
3 "	15	8	5	4	3½	3	2	1¾	1½
4 "	27	14	9	7	5½	5	3¾	3	2½
5 "	46	21	14	11	9	7½	6	4¾	4
6 "	60	30	20	15½	12½	10½	8	6½	5½
7 "	82	42	27	21	17	14	10¾	9	7½
8 "	107	54	36	27	22	19	14	11	10
9 "	137	68	45	34	28	23	18	14	12
10 "	167	84	56	42	34	30	21	18	15
11 "	202	101	67	51	41	37	26	21	18
12 "	241	121	80	61	49	41	31	25	21
13 "	283	142	94	71	57	48	37	30	25
14 "	328	164	109	83	66	56	42	34	29
15 "	376	189	125	95	76	64	48	39	33

A WARNING TO PHOTOGRAPHERS TRAVELLING IN FRANCE.

The Foreign Office have issued the following notice :—'All persons travelling in France are hereby warned that, under the provisions of a recent French law, the following acts are made offences punishable by fine and imprisonment :—Making sketches, drawings, or plans in the vicinity of a fortress or naval station ; scaling palisades ; entering military enclosures and mounting earthworks or parapets ; also the asking of any questions upon any points concerning the State defences.' Photographic tourists in France—for photographs are there classed with sketches and drawings—will do well to heed this warning.

STANDARD DEVELOPER OF NEW YORK AMATEUR SOCIETY.

No. 1.

Water	32 ounces.
Yellow prussiate of potash	3 ,,
Carbonate of soda	3 ,,
Carbonate of potash	3

No. 2.

Water	32 ounces.
Sulphite of soda	3 ,

To one and three-quarter ounces of No. 2 add a quarter of an ounce of No. 1 and four grains of dry pyro.

THE WOODBURY TISSUE.

Towards the close of the year the above tissue is introduced for public favour. It consists of thin, tough paper, which, after having been rendered transparent by treatment with gums, is coated on both sides with gelatine emulsion. Some highly successful work has been made on this tissue.

PROPERTIES OF THE ALKALIES IN DEVELOPER.

The Editors of The British Journal of Photography having described some experiments with the several alkalies, say :—

'The results of our experiments, briefly told, amount to this: Soda as the developer gives on the whole the least density, potash the greatest, ammonia lying between. Either of the fixed alkalies indicates decidedly the greater sensitiveness. The question to be discussed is whether or no potash is to supplant ammonia, and the reply will turn on the fog or no fog question. We leave it to our readers to solve.'

ORTHOCHROMATIC PHOTOGRAPHY.

Dr. Mallmann sent for exhibition to the Photographic Society of Great Britain some portraits, concerning which he said :—

'The portraits which are exhibited are all taken on gelatino-bromide plates, sensitised in a bath of erythrosin, which is a tetra-iodofluorescein. The method of sensitising was as follows :—After having dusted the plates, they were passed through the following bath, where they were allowed to remain two minutes :—

Ammonia	2 parts.
Distilled water	200 ,,

'Afterwards, the plates were dipped in a bath, having the following composition :—

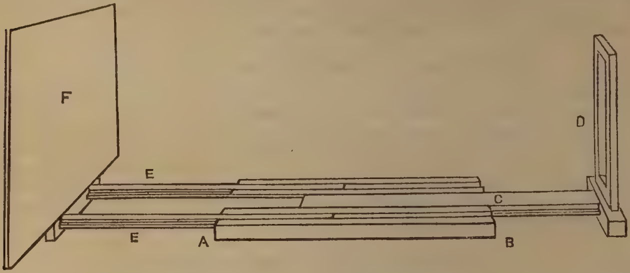
Erythrosin (1 : 1000 of water)	25 parts.
Distilled water	175 ,,
Ammonia	4 ,,

'The plates were then allowed to dry in the dark. These operations should be carried out in a deep red light, and not too much of it. The baths should always be covered. The emulsion with which the plates are to be prepared should not contain more than one per cent. of silver iodide. The developer should be the alkaline developer (pyrogallic); ferrous oxalate cannot be used, owing to its liability to give foggy pictures. The general and relative sensitiveness for the yellow rays which can be obtained by this bath process is so extraordinarily increased, more especially for the yellow rays, by the erythrosin, that it is twenty to twenty-five times more rapid than an uncoloured plate to the light of a petroleum lamp, which contains a large proportion of these yellow rays.'

MECHANICAL INVENTIONS OF THE PAST YEAR.

CHEAP AND SIMPLE ENLARGING APPARATUS.

Premising that many more photographers, both amateur and professional, would make their own enlargements if they were not deterred by some imaginary idea that the process is either one of great difficulty, or that it involves an outlay of a considerable sum to procure the necessary apparatus, Mr. J. Vincent Elsden has devised a piece of apparatus which is described as follows:—A baseboard, A B, is taken, having a length of about two feet, and a thickness of at least two inches. In this board a wide groove is cut in the centre, in which runs the thinner slab, C, which carries the upright support, D. Two narrower grooves are then made on each side of the centre groove, in which run the two square rods, E E, which carry the rectangular support, F. A glance at the accompanying figure will show that, when closed, the lens carrier, D, and the support, F, are about two feet apart, but that they can be separated, while still keeping parallel, to nearly three times this distance. The size of the board, F, and indeed of the whole apparatus, depends upon the size of the enlargement required; but it should, of course, be made to suit the largest size that could possibly be wanted. It is important, also, that the board should be made of sufficiently stout material to prevent any danger of warping. The front, D, is also grooved so as to take the ordinary sliding front of any camera, so that the lens may be raised or lowered as required.



The remainder of the process is very similar to that adopted with an ordinary enlarging camera. A hole is cut in the shutter of the window of the dark room, and a frame made to take the negative. It is important that the plane of the negative should be parallel with the plane of the shutter. The above-described apparatus is then placed in position before the negative, and a hood of black cloth arranged so that all the light which passes through the negative can pass only through the lens. There are many ways of contriving this. I have simply nailed one end of the hood to the shutter around the hole, and secured the other end with an indiarubber band around the lens, taking care to make the hood large enough to keep clear of the negative. Having once got the baseboard of the enlarging apparatus accurately adjusted to the plane of the negative, it may be securely clamped in position, and all further adjustments made by drawing out the lens carrier, and the support F, to any required length. Focussing can be perfectly well done by this means; but it is, of course, better to finish the focussing by means of a screw, if great accuracy is required. The support F, if used for enlargements on paper only, is sufficient without any further arrangements, as the paper can be secured in position by pins. Opals, also, can readily be secured by small nails or drawing-pins.

PLATE-COATING MACHINE.

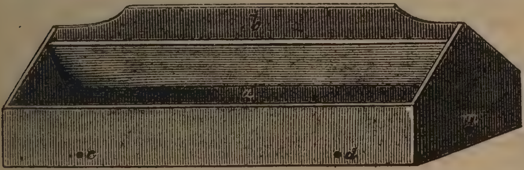
Mr. A. Coventry has made a plate-coating machine suitable for doing work on a small scale. It consists of a large wooden box fitted with a number of shelves, one overlying the other. Each shelf is fitted with ridges, so as to hold two parallel rows of plates, the close contact of which is secured by a clamp at one end of the machine: the emulsion is thus prevented from running to the under surface of the plates. The spreader is contained in a carriage on wheels, and is moved by a handle, each revolution of which admits a certain quantity of the emulsion through a valve, thus allowing a constant flow on to the plates whilst the machine is in motion. The apparatus holds about eight dozen plates, 7½ × 5, all of which can be coated in about fifteen minutes; no special emulsion is required, and the manipulation is simply and easily done. By an arrangement for obtaining draught, the apparatus, after the plates are coated, becomes its own drying chamber.

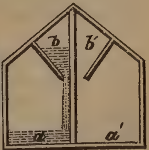
IMPROVED PRINTING FRAME.

Mr. C. Butterworth has invented a printing frame, which is intended to enable the person printing to look at the print without in the least moving the print or negative. 'I take,' he says, 'a five-eighth centre-bit, and bore down to the bottom of the rabbet within one-sixteenth, and cut out the half of the hole nearest to the rabbet, which form a D-like slot, each facing the other. Into this I *fit* a piece of wood slightly thicker than the depth of the rabbet; to this piece of wood, or bar, I screw the hinges, and make the three pieces, when put together, the same length and width as the doors in the ordinary printing frame, with this difference—the middle bar has to project as much as is required to fit into the frame. The bar is fixed by two small thumbscrews; and when the negative and paper are in the frame, the thumbscrews hold both fast. The three pieces are covered with one piece of cloth, and cut across so as to form one level piece to fit on the negative. A frame made like this any one may use without the slightest fear of moving either paper or negative.'

AUTOMATIC WASHING TROUGH.

The Rev. S. J. Perry, F.R.S., describes an automatic washing trough which has been in use at Stonyhurst Observatory for many years. The prints are placed on the flat surface a, a', and the water flows from a tap directly into the triangular chamber b or b', passing thence very quietly over a or a'. When, for instance, b is under the tap and the water rises in a to the depth of about one inch, the whole trough, resting on the axis m m', tilts over, and b' at once begins to fill and gently supplies a' with fresh water, a being in the meantime





emptied by the small orifices *c* and *d*. This simple arrangement is of the greatest service, never getting out of order, and doing its work in a most thorough and satisfactory manner.

A STEREOSCOPE.

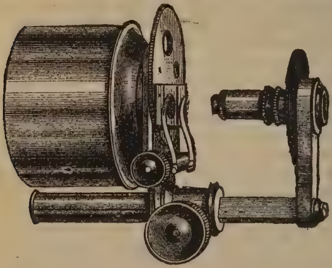
A NEW form of stereoscope was described by Mr. Stroh at a meeting of the Royal Society. The principle of the instrument is that by means of a pair of lanterns two stereoscopically correct images are made to rapidly alternate on the screen, and are viewed by each eye alternately by means of a disc pierced with apertures revolving at such a speed as to present each picture to the proper eye in such rapid sequence that a continuous image—and that a stereoscopic one—is perceived. But this form of stereoscope was described by Mr. H. Grubb long anterior to Mr. Stroh's demonstration.

AN INCANDESCENT GAS-BURNER.

DURING the past year an effort has been made to introduce Dr. Auers's incandescence gas-burner—a burner which, if it perform all that is promised of it, might revolutionise gas lighting. The principle consists in rendering a special made fabric luminous by the heat developed from a simple Bunsen's burner. The special material, an oxide either of lanthanum or zirconium, is made in the form of a cylinder, and through it the flame passes and renders it incandescent.

MICROSCOPIC ATTACHMENT FOR THE LANTERN.

MESSRS. NEWTON & Co. have recently perfected an excellent and simple microscopic attachment to the lantern, to be used with a limelight. It is shown in the cut, which explains itself. The front lens of the lantern is unscrewed, and the microscopic attachment screwed in its place. An alum trough should be placed in the ordinary slide stage of the lantern, filled with a saturated solution of alum, to protect the objects from the heat. To make this solution, add common alum to hot water, till the water will not dissolve any more; allow the solution to cool; let it stand some hours, and then pour off the clear liquid for use. If preferred, it may be filtered through blotting-paper. It must be perfectly clear and limpid when used. The same solution may be used any number of times. The only adjustments necessary are those of the light, as regards distance from the condenser; and the focussing, which is effected by rack and pinion.



GLASS STOPPERS FAST IN BOTTLES.

Mr. T. HARRISON says:—'For many years I have prevented this trouble by a simple contrivance. Every glass stopper is made hot, either by dipping in boiling water and wiping dry or holding it over a Bunsen or spirit lamp. I then rub a paraffine candle round it to form a very thin film, and it never sticks to the bottle.'

A DARK ROOM ELECTRIC LAMP.

MR. SCHANSCHIEFFS has invented an ingenious dark room electric lamp, with battery. The battery has four divisions, containing sulphate of mercury solution, in which the carbon and zinc plates are immersed. When charged with the solution, a cover, lined with rubber, is firmly screwed down upon the cells. The battery is suspended upon centres in the side, and is capable of having its vertical position reversed. The arrangement is such that when in one position the exciting fluid does not touch the zinc plates, but by rotating the battery the action is immediately started, and is attended by a projection of beams from the incandescent lamp attached. It is fitted with both plain and ruby coloured glass. It is indeed a most handy little lamp, and will remain a long time in action without entailing its being recharged with solution.

A NEW PHOTOMETER.

THIS instrument has been introduced by Mr. H. D. Taylor, who makes use of the practically constant light of the Standard Parliamentary Candle. One of these, enclosed in a light-tight little lamp, supplies a light with which the visible actinic light from the darkest visible detail of the subject is compared in a manner enabling the photographer to arrive at the exposure by simply multiplying together two or three figures or numbers. Further details will be found in THE BRITISH JOURNAL OF PHOTOGRAPHY for April 23, 1886.

REVOLUTION IN MAGNESIUM.

DURING the past year the price of magnesium, which had hitherto been sold at from twelve to fifteen shillings an ounce, has been reduced to half-a-crown. There are no means extant by which a most powerful, richly actinic light can be improvised, on the spur of the moment if necessary, for photographing either a single figure or a group long after the sun has set as that afforded by magnesium. A match is applied to the end of a bit of magnesium ribbon, and, presto! the room is flooded with light so bright and intense as to render the photographing of even a group a matter of such ease and expedition, that a brilliant negative can be secured by an exposure of a few seconds, and at a cost of less than a halfpenny. Magnesium forms, in effect, a portable and even a pocketable electric light, the powers of which are evoked into action by the striking of a match.

PORTABLE STANDS.

MR. LANCASTER, of Birmingham, has introduced a portable stand, the nature of which will be ascertained from the following extract from his specification:—

The leg or support consists of two parts, and each part is composed or made up of two parallel strips or lengths of wood, or any other suitable material, and sliding upon each other (that is, one part upon the other) in such a manner that the leg is able to be lengthened or shortened to accommodate itself to varying heights, when in use, or when contracted or folded up for portability; and connected to the respective ends of the said parallel strips of the one part are eyes or clip guides, which embrace the strips or sides of each adjacent strip; that is to say, both parts carry at their ends double clips, which allow the one part to slide within or upon the other, and so reduce the length of the leg to that of about one half.

In order to impart stability and perfect rigidity to the leg produced, which forms a part of the stand, I arrange at or about the middle of the said leg, and between the bars, a system of jointed levers, which constitutes a tension expander or opener out; that is, the system of levers are arranged in the form of a lozenge, jointed top, bottom, and sides, the middle of the side arms being connected to the opposite thin strips constituting the leg; and against the inner sides of the said strips, roughened or pinion-like bars or axes bear.

These pinion bars cross and connect the sides of the arms, and forms the centres on which they turn; and depending from the upper joint or joints of the arms of the said levers is a rack, the teeth of which engage with a bar or axis passing from the lower joints; so that as the jointed levers open out, the rack teeth engage with the bar, and so retain the lever arms in a fixed position with the sides or strips which constitute the leg of the stand forcibly pressed outwards, thereby imparting great strength and rigidity thereto, by increasing the sectional area of the middle of the legs embraced by the sides or thin strips described.

The widening out of the middle of the legs can be regulated and adjusted by the teeth of the depending rack, according to the weight to be sustained. Thus, if only a moderate rigidity is required, less tension or opening out of the legs is given; and further, instead of employing the system of levers carrying the rack, the rack may with like effect be attached to one side of the opening out parts, and a peg on the other; and moreover, the opening out or widening expedients hereinbefore described may be employed with legs which are non-sliding, the sides being made in one piece, or of one length. The legs described are generally used in threes, which are commonly called a tripod stand; the ends of the sides of the legs being connected together and provided with the usual appendages.

IMPROVED CAMERA AND SLIDE.

We quote the nature of the improvements effected in cameras by Messrs. Underwood, of Birmingham, from their specification:—

Our improvements consist, firstly, in obviating the necessity for removing the lens when closing folding-up cameras, and, secondly, an improved construction of plateholder for containing and exposing the sensitive plate in the camera.

To obviate the necessity for removing the lens from the camera front, we make an aperture, circular or otherwise as necessary, through the baseboard of the camera, and on the underside of the baseboard we attach an annular ring of metal, through which the lens mount projects, and to which are attached, in the usual manner, three legs or supports for the camera. The ring of metal revolves within suitable bearings fixed to the baseboard, and is held in any particular position by a thumbscrew or any other convenient means.

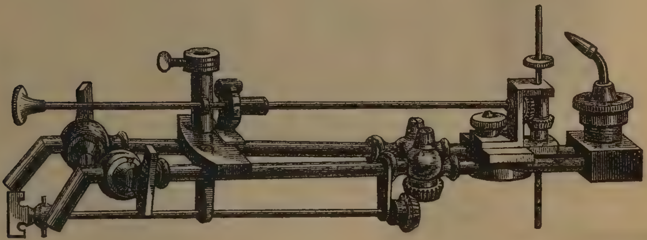
The plateholder consists of a rectangular frame of wood or other suitable material, having on each inner edge a rabbet. A strip or strips of metal being fixed on the inner edge of the frame, converts the rabbets into grooves. A rectangular piece of thin metal or other suitable substance has its edges turned up, forming a shallow tray, the edges falling into and fitting the aforesaid grooves, and forming, when properly blackened and finished, a light-proof receptacle. One side of the closing shutter or tray is formed as a hinge, with the axis carried through the frame to the outside, and having a suitable handle to operate it by.

THE DIAPHRAGMATIC SHUTTER.

The Diaphragmatic Shutter of Mr. Wollaston is among the latest of those more prominently introduced as possessing special claims to public favour. According to the way in which it is used, it may be employed either for giving time exposures or instantaneous snaps. The exposure is effected by the action of two wings moving in contrary directions. These act in such a manner as to commence the exposure by a small speck of light in the centre, which expands till full aperture is reached, when further action is either arrested at will of the operator, or permitted to proceed until by a continuous motion of the wings the further admission of light is stopped. The period of time involved in this action is determinable with certainty and simplicity by means of a milled head projecting from the framework, for while an exposure of several minutes may be given, for interior work, for example, yet by the judicious manipulation of the milled head may the action be so quick as to show with the greatest ease the spokes of the wheels of any conveyance passing rapidly in front of the camera. The optical principle involved in this and every shutter in which the movement commences by giving an illumination from the centre as the initial and terminating phase of exposure is this, that the picture is taken by a series of diaphragms gliding imperceptibly from the smallest to the greatest, and that in this way a greater degree of penetration is obtained than could be the case if only the full aperture of the lens were employed throughout the exposure.

THE OXYHYDROGEN JET MODIFIED.

An improved limelight burner has been made by Messrs. Newton for Mr. Pringle, who thus speaks concerning it :—'In lectures there is often a long interval when the light is not wanted at all and the gases are merely being wasted, unless the light is turned right down as before. I accordingly devised the addition to the jet figured here. The tubes of an ordinary jet are cut and two extra taps fitted anywhere in front of the usual taps, but preferably pretty near the middle, between the upright pin and the lime pin. The hydrogen tap has a small bye-pass ; the oxygen is a complete cut-off. The two taps are turned equally and simultaneously by two toothed wheels working into each other and of equal diameter, so that the gases, when the wheels are turned, are lowered proportionally, and the light is only lowered without losing quality.

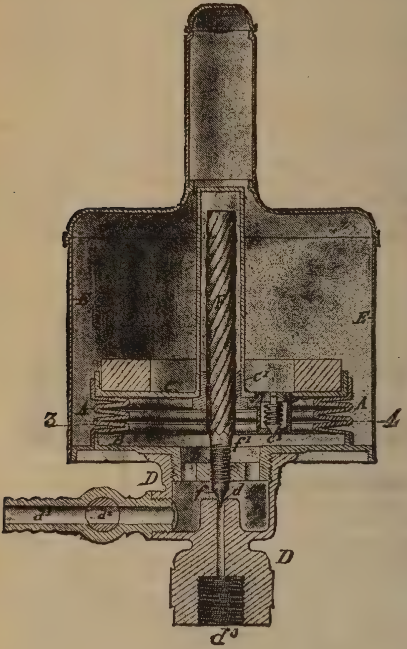


'The manner of using the jet is simple. The extra taps are turned full on, and the usual taps worked so as to get the best possible light. When desired, the extra taps can be turned lower at will by the milled head, and again turned full on by the same means, without any interference with the "normal" taps. When the light is not wanted at all on the screen the oxygen is cut right off, while the bye-pass allows a sufficient quantity of hydrogen to pass, not only to keep the lime hot, but to allow of a full relighting at a moment's notice.'

OXYGEN AND HYDROGEN REGULATOR FOR THE LANTERN.

Compressed gas in bottles has not hitherto generally been adopted, in consequence of the trouble to regulate the ever-decreasing pressure. Although bottles have been made to contain from seven to fifty feet, and being made of steel have been compressed to even 3000 lbs. pressure upon the square inch, it was impossible to use them with success, unless a valve or regulator was supplied to give off the gas just as required. Messrs. Oakley & Beard have patented a governor, which unquestionably will raise the standard of limelight exhibitions, and give a portable and easy way of storing the gases and using the limelight.

The action of the regulator will be understood by reference to the sectional diagram, in which *A A* is a circular bellows of the finest rubber; *B* is the base plate to which it is attached; *C* the movable head to which it is also attached; *D* is the casting that fits the neck of the bottle at d^3, which carries at its centre a valve seat *d*, and has projecting from it laterally a delivery pipe d^1 fitted with stop tap d^2. The movable head *C* is fitted with a central tube *C* closed at its upper end; at its lower end a nut is fixed C^1, which is threaded internally to receive a quick screw *F*. This screw forms the spindle of regulating valve *f*, which fits the valve seat *d* made in the casting *D*. Immediately above the valve a slow thread, f^1, is cut on the valve spindle, and in the neck of base plate *B* a thread is cut to correspond with the thread f^1 on valve spindle; openings are made in this neck for the passage of the gas into bellows, and as the pressure of the gas varies the bellows will be caused to expand or contract, the tendency of the weighted head *C* being to force the bellows into the compressed state. As the weighted head descends it will impart an axial motion to the valve spindle, and thereby cause the valve under the action of the screwed neck *b* to recede rom its valve seat, and thus enlarge the opening for the delivery of the gas. When the pressure of the gas is in excess, the weighted head will rise and give an axial motion in the opposite direction, and force down the valve towards its seat. By this means a perfect automatic regulator of the delivery is effected. *E E* is simply a metal casing for protection. Thus this regulator will supply one jet or twenty, and from only one bottle, automatically, as required, without touching the taps.

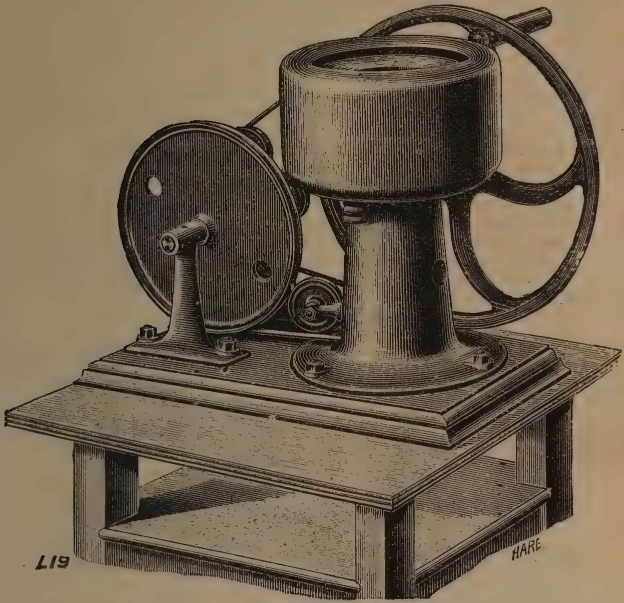


VERGARA'S DARK SLIDE.

Mr. Vergara, of the Woodbury Tissue Company, has invented a dark slide, which is both thin and well adapted for its purpose, which is the exposing of the films or sensitive tissue made by this company. The advantages claimed for this slide are that the paper is readily inserted and as readily removed; that the weight of one slide with two papers is about one-half to one-third the weight of the ordinary double dark slide with two glasses; that it can be easily fitted to existing cameras, and that the register of the focussing glass is the same as with the old slides. It is filled for two exposures by the insertion of a shutter—no loose parts and no hinges. No carriers are required, as pieces of paper, of smaller size than the slide can be inserted for exposure.

THE CENTRIFUGAL SEPARATOR.

BELOW is a drawing of a hand centrifugal separator, made by Watson, Laidlaw, & Co. of Glasgow which is coming to be much employed in the preparation of gelatine emulsions. By the multiplying pulleys and bands a high rate of speed is attainable.

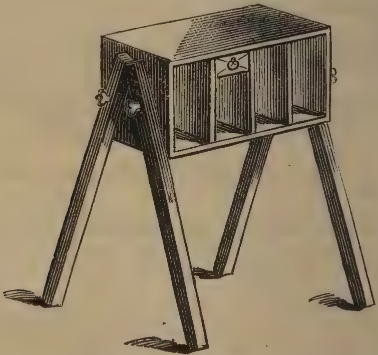


PORTABLE APPARATUS FOR GENERATING OXYGEN.

'PROFESSOR L. H. LAUDY, of New York,' says the *Scientific American*, 'exhibited before the New York Society of Amateur Photographers an improved apparatus for generating oxygen gas, designed as a substitute for oxygen gas-bags and cylinders, and showed how applicable it was for the use of amateurs in producing a powerful limelight for the optical lantern. The blow through jet was used; the ordinary street gas, taken from the gas fixture, furnishing the hydrogen. The oxygen mixture of chlorate of potash and manganese was held in a metal tube of tin, two feet long by two inches in diameter, supported in a horizontal position on a light stand, about eight inches above the base. A special improvement in these cylinders consisted in having a removable metal, conical-shaped, brass plug at one end, which was held in place, after being driven in by a slight tap of the hammer, by the compression of the end of the tube. The object of the plug was to permit the materials to be easily discharged from the tube after the oxygen had been exhausted, then to be refilled again with fresh potash and manganese. To produce the gas, it was only necessary to heat the tube with a Bunsen burner, commencing at one end and gradually sliding it along on the base under the tube at intervals until the oxygen was exhausted from the chemicals. Leading from the oxygen tube was a rubber pipe, which communicated with a copper gas holder, eighteen inches in diameter by about the same depth. The upper cup fitted into a similar inverted bottom cup having a deep annular recess, which held about three quarts of water, the latter acting as a seal. The whole was supported in a light wood frame. An improvement devised by Professor Laudy consisted in making a square tube (quarter inch square), extending from the top of the upper gas cup, act as a guide to the upward or downward movement of the holder. On the upper portion of the wood frame was a metal sleeve, through which the exit square guide tube passed. From the upper end of the latter extended a flexible tube to the burner. A weight placed on the upper cup of the gas holder gave a uniform pressure to the gas. To start the apparatus, the Bunsen burner was lighted and placed under one end of the oxygen tube ; as the gas was generated, the upper cup of the holder filled and ascended, similar to the action of a gasometer. When half elevated, the limelight burner was lighted, and in a short time a brilliant light was produced, perfectly noiseless, steady, and estimated to be equal in intensity to 125 candles. One tube of the mixture would supply sufficient gas for an hour's exhibition.'

STAND FOR THE LANTERN.

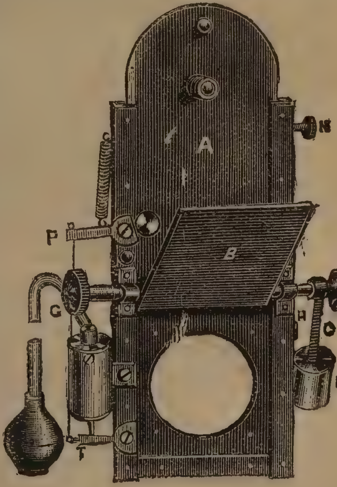
Giving reasons why the tripod stand is not the best for supporting a lantern during an exhibition, Mr. Albert W. Scott says :—'A plan I can recommend is to procure four wood legs, about one and a half inches square, and four and a half feet long, and to attach these, by means of strong thumbscrews, one for each leg, to the slide or lantern box, so as to make a four-legged table or stand.



The legs should not be upright, but spread outwards at the base, the proper angle being maintained by small slips of wood screwed permanently on the outside of the box. When packing the apparatus for travelling, the four legs are detached from the box, and may be strapped together. The cut represents such a stand, which is as rigid as any one need desire. A slight fore-and-aft movement of the table does not affect the image on the screen: it is the sideway shake that is to be avoided. If the legs are disposed as in the cut, the sideway shake will be *nil;* the fore-and-aft shake is so small as to be harmless. By "shake" I imply the extent to which the stand will yield under the influence of a push. The box shown in the cut is not the lantern box, but is intended for slides. It will be seen to have partitions. which, although not absolutely necessary, are useful in keeping the framed slides in their proper order, so as not to require rearranging on reaching the hall. The lid is not shown in the cut, as it is best made so as to take off completely when erecting the apparatus for an exhibition. A small drawer between the partitions is useful for packing the thumbscrews, coloured glasses, and slide-stage bars; for in lantern matters the saying holds good, "A place for everything, and everything in its place." A red or green cloth should be provided to throw over the stand, and cover the travel-soiled appearance the box presents. A coloured table-cloth will answer the purpose as well as a specially made cover, and will probably be more economical in its first cost. If an extra shelf be desired, it can be easily made by stretching a small piece of sailcloth under the box by means of hooks which fit into screw-rings in the legs.'

INSTANTANEOUS AND TIME SHUTTER.

Messrs. Reynolds & Branson, of Leeds, have effected further improvements in their Phœnix shutter which is now operated by a pneumatic arrangement, that permits of either a practically instantaneous or a prolonged exposure being given. The way in which it operates will be ascertained from the accompanying illustration. When the pneumatic ball is pressed it allows the weighted arm to raise and retain open, as in diagram, the flap B; the drop A is by the same pressure held from falling by the catch P, any desired length of time. Release of pressure instantly allows A to fall and cover lens. When the pneumatic catch is not required the connecting cord is released from T. When an exposure of about one quarter second is desired, the band is removed and the flap is raised by means of the weighted arm C; the weight D being alterable as to size, and movable as to acting distance from spindle E. The arm C rotates on spindle, and may be fixed in any position by milled screw F. Slow exposures may be made by fixing A by means of milled screw attached to shutter, and by regulating the exposure by B; the movement in this case is imparted by means of milled head G. When this action of the shutter is used the catch I must be released, and the weighted arm clamped so as to keep B closed. The slowest automatic action of the shutter is obtained by gravity without the rubber band, when the arm and weight are arranged at an angle of about 20°. If a rather quicker motion is wanted, arrange weight



and arm at an angle of about 40°, and move the weight to its extreme acting distance.

Two additional accelerations for medium exposures may be obtained by using a long and weak rubber band in conjunction with the weight; the band has more or less tension according as it is placed on the upper or the lower pin of A.

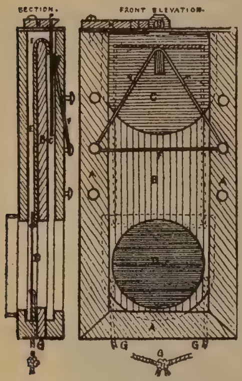
SOLID GROOVED PORCELAIN BATH.

Messrs. George Mason & Co., of Glasgow, have introduced a grooved alum and fixing bath, made in solid porcelain. This is exceedingly effective, and saves the surface room of trays upon trays.

BACKGROUND STAND.

Mr. Robert Turnbull (of Turnbull & Sons, Glasgow) has invented a background stand. In this, by means of suitable pulleys, the background can be immediately raised or lowered, so as to bring any part of it in relation to the sitter's head. Provision is made by which one background can be immediately unshipped and another substituted. Mason & Co. are the makers.

FORREST'S 'DUE RATIO' SHUTTER.



The following is a brief account of the 'Due Ratio' Drop Shutter invented by Mr. Thomas Forrest of Pontypridd:—

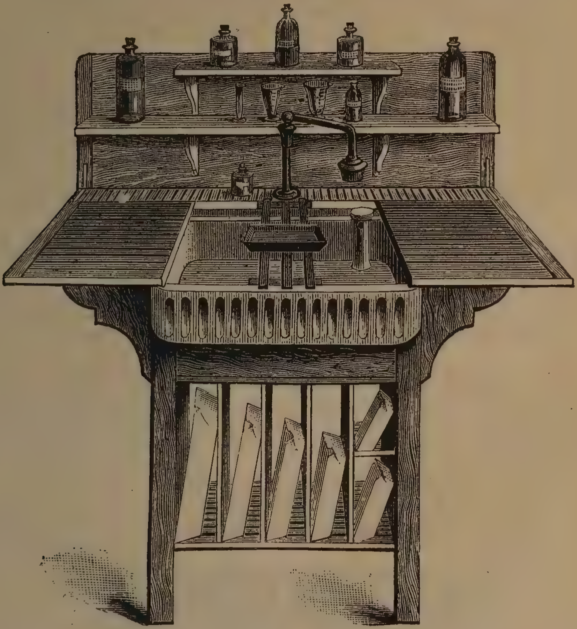
The principle of the shutter is good, as will be seen by referring to the adjoiniug cut, in which it is shown both in front elevation and section. C and D represent two plates connected by cords, which run over a pulley at the top. They act in such a manner that when, by the liberation of a catch, the lower one ascends and uncovers the lens the upper one descends and recaps it. This motion may be effected either by gravity, one plate being slightly heavier than the other, or it may be greatly accelerated by the employment of a rubber band, F, attached in the manner shown in the cut. Seeing that the exposure is made while the shutters are in motion, and before they come to a stoppage, it follows that there will be no jar or vibration of the camera until after the exposure has been completed.

IMPROVEMENTS IN CAMERAS.

Mr. McKellen has been busy during the past year in still further perfecting his admirable camera. His latest improvements are—in addition to the turntable, folding front, and double pinion, as follows, viz.:—The fork which supports the swinging is now pivoted with strong pivots into the plates at the side of the sliding frame in baseboard, and the hinges which were at first used are now done away with. Although the camera was considered strong at first, this improvement imparts to the front a wonderful amount of rigidity. The bellows are now made with very little taper, so that a front aperture is now obtained much greater than before. Mr. McKellen attaches his reversing frame to the camera body by a simple up-and-down movement, which clips the frame both top and bottom, and dispenses with both hooks and springs. He has also arranged his camera back so that the slides are inverted either from left or right. This is useful when photographing interiors, or where a camera has to be set up close to a wall; the slide can then be inserted, and the shutter drawn out at the left side. By this means also two pictures can be taken on one plate without moving the lens or the reversing frame.

DARK-ROOM DEVELOPING SINK.

So well did the jurors of the late Photographic Exhibition think of the development sink shown below that they awarded a medal to Messrs. George Houghton & Son High Holborn, for it. This handy dark-room appliance includes every requisite for development, and is so constructed as to be rendered portable. The sink is of vitrified enamelled stoneware, and is fitted with an overflow waste stopper, so that it may be used either full or empty. The water is supplied through a swing tap, extending to the centre of the sink, having a rose at the end of the arm, which will be found very advantageous for thorough washing, &c. The tap is so arranged that the flow of water gradually increases in force as the arm is extended.



AN AUSTRALIAN DETECTIVE CAMERA.

Mr. E. Purton, of the Amateur Association of Victoria (Australia), has invented a camera which may be somewhat briefly described as follows :—There is a rather long box open at one end. In the inner end is a cupboard with one shelf across the middle, on which is placed the unexposed plates, the lower portion being used as a receptacle for the plates after exposure. This cupboard is closed by a light-proof door which opens inside of the box, and lies when open against the top, where it is held by a bolt. The open end of the box is closed by a wooden partition in which is a hole fitted with a sleeve, through which the hand of the operator is passed when manipulating the plates. The space between this sleeved partition and the cupboard forms the camera proper, the lens being attached to one side (the front) and the sensitive plate being erected by suitable 'fixin's' at the back. Thus the width of the box must be determined by the focus of the lens that is to be employed. But the lens (which in this case is a Ross' rapid symmetrical six-inches focus) is kept inside, so that nothing is seen from the outside save the hole through which the view of external nature is admitted to the lens. To manipulate the apparatus the right arm of the operator enters the sleeve, the hand then opens the cupboard door and takes a plate from the upper compartment, and erects it *in situ* at the back of the exposing chamber or camera, when, the door of the store department being closed and the hand withdrawn (the lens meanwhile being also closed by the exposing shutter), everything is now ready for taking a shot at whatever presents itself. This is effected by pulling a string, which liberates the shutter and exposes the plate. Again is the hand introduced through the sleeve, the cupboard door is opened as before, the exposed plate placed in the lower division, a fresh plate taken from the store above, and the hand withdrawn, when all is ready for another picture.

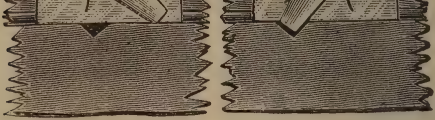
To prevent suspicion on the part of the numerous loungers who usually gather round when a camera is being erected in the street, the apparatus is wrapped up in brown paper having a hand-strap around it, the aperture pierced in the side for admitting light to the lens being for the nonce covered by a loose scrap of paper, which is removed at the proper moment. It also serves an ordinary camera.

NEW ROLLER SLIDE.

Messrs. Morgan & Kidd, in addition to having perfected an excellent roller slide, which contains several ingenious mechanical features, have also introduced a means by which paper can be used in an ordinary dark slide, in which it is held both tightly and with perfect flatness. It is qualified to prove very useful.

LOCKING THE DARK SLIDE.

Mr. F. Hazeldine has invented an ingenious appliance, called the 'Godstone Carrier Lock,' by which all danger of exposing a plate twice in the camera is quite obviated. Its nature will be ascertained from the accompanying cuts.



In one figure the 'ock' is shown ready to permit the slide shutter to be drawn out without hindrance, the catch offering no obstacle; but no sooner has the shutter been drawn than the catch assumes a position in the line of the two wire springs, and on the reinsertion of the slide is by it pushed to the opposite side, where it falls in due course into the notch on the edge of the shutter, effectually preventing its withdrawal. The attention of the photographer is thus directed to the fact that this plate has already received its exposure. The 'lock' is simple, and easily fitted to any slide.

ROUCH'S CABINET FOR SENSITIVE PAPER.

MESSRS. W. W. ROUCH & Co., Strand, have introduced a box, or cabinet, for holding sensitive paper prints. The box in question is constructed to hold whole-plate sheets when laid down flat, and they are retained in this position by a movable weighted lid, which rests on the paper and keeps it flat, while capable of being instantly removed. Thus the paper is shielded from the light even when the hinged lid of the box is open. With two of these, one in which to retain the sensitised sheets and the other for the paper after it is printed, the comfort of the printer must be greatly increased.

SUBSTITUTE FOR FOCUSSING CLOTH.

MUCH having been said about the trouble and unsightliness of the focussing cloth, Mr. McKellen has set himself to solve that difficulty. He has now patented a new ground-glass protector, which effectually protects the ground-glass when the camera is being carried about, and which when in use is made to act as a screen to shade the light from the ground-glass when focussing. Mr. McKellen holds that no cloth should be required over a camera, and that the workmanship of a camera should be good enough to keep out light without any such aid. A notable improvement is observable in camera stands.

CAMERA STANDS.

MR. McKELLEN has improved his threefold sliding stand by the addition of the cam lever grip, which by the simple action of a small lever binds the sliding part between the two middle parts of the legs, and by this means a marvellous amount of strength is secured. The turntables, which formerly had pins in them on which the legs clipped, are now made with holes in, and the pins are in the leg tops instead.

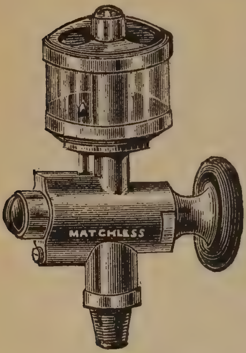
A ROCKING TABLE.

BOTH at the Derby Convention and the Photographic Exhibition Mr. McKellen exhibited an automatic rocker, which consists of a table on which stands a board poised on points. By means of clockwork (which is of a most substantial character) a connecting rod actuates the poised board, to which is imparted a rocking motion. If a developing dish be placed on the rocking board and the mechanism be started, the liquid in the dish is made to flow steadily backward and forward. This will prove useful for other purposes than the development of plates; amongst others, for employment in etching metallic plates for surface printing.

Among other inventions of this facile inventor is an automatic roller slide, which does everything automatically. It records the number of exposures, marks a distinct line between the pictures, locks itself fast when the exposed portion is wound on the receiving roller, and the whole of the exposed paper may be rewound on the stock roller.

Another invention of Mr. McKellen's is the auxiliary focusser and view finder. This is an arrangement by which a lens (a common spectacle lens will do) of about the same focal length as the photographic lens that is being used, and fitted to the front of the camera, is made to project an image of the picture, or a part thereof, on to a ground-glass fixed at the back of the camera, the objects being the same size as they appear on the camera ground-glass. This enables the picture to be focussed correctly whilst the dark slide is in the camera, and permits instantaneous pictures to be taken with the certainty of being correctly focussed.

A DARK-ROOM GAS-BURNER.



A GAS-BURNER for the dark room has been introduced by the G. K. Cooke Manufacturing Company. Its peculiarity consists in there being a bye-pass and a separate burner, through which a flame of very small dimensions is always kept lighted, and which is hidden out of sight by a cap. Upon turning a tap the gas from the main burner is ignited by the small jet. This will be found very convenient in many dark-room operations, especially when one is engaged in printing transparencies, as it enables one to obtain alternations of light and darkness without having to encounter the necessity of striking a match every time that a bright light is wanted.

WATSON'S DETECTIVE CAMERA.

AMONG the mechanical inventions of the year, Watson & Sons, of High Holborn, London, have introduced a detective camera of an elegant form. Externally it assumes the form of a leather case $9 \times 7\frac{1}{2} \times 5$ inches, with a handle on the top, by which it is carried. When used it is held in the right hand and steadied by the left hand, the thumb of which rests upon a button which, when pressed, gives the exposure. The exposing shutter, which is composed of two wings opening from the centre of the lens, is controlled by a milled nut outside, by which any degree of rapidity or slowness is imparted, thus regulating the exposure according to the light or rapidity of the plate. Like other cameras of the detective class, there is a small square of ground-glass on the top, which forms part of a finder, on which is seen displayed any subject to which it is directed. A lever on the bottom provides the means of focussing. When pressed to one end of its range the lens is then at its zero, and everything is in sharp focus from extreme distance to within twelve yards; but by moving the lever objects as near to the camera as five or six feet can be rendered quite sharp. The size is quarter-plate, and there is accommodation inside for three double slides. This is the most perfect and beautiful of the detective class of cameras we have yet seen.

MICROSCOPIC CAMERA.

MESSRS. WATSON have introduced a convenient camera for photographing microscopic objects, in which the various adjustments are made by rods, with milled heads, which project at the back within easy reach of the operator's hand. The illumination is by a plain magic lantern, and the microscope in use is a small histological one. The camera has three feet of extension. While there is no point of absolute novelty in itself, yet the way in which pre-existing features are combined render this a useful and complete microscopic camera. There is this advantage in its construction, that any one who already possesses either a lantern or a microscope can have them utilised by obtaining the baseboard, on which they can be mounted—no small boon to those who like to use up their old material in building a new instrument.

REMOVING FIXED STOPPERS.

The *Chemist and Druggist* has gathered from various sources a list of well-known methods for getting fixed stoppers from bottles, which are well worth preserving in this collated form by every housekeeper. When a stopper is found to be immovable, it may often be loosened by gripping the neck of the bottle firmly in the left hand, applying the thumb at the same time with a firm upward pressure against one side of the head of the stopper, and smartly tapping the opposite side with the handle of a spatula or other suitable piece of wood. The force should be applied in the direction of the longer axis. The operation may often be expedited by placing a drop of oil or other liquid—according to the nature of the contents of the bottle—on the line at the junction of the stopper and the neck of the bottle; when the stopper is tapped a minute space is momentarily formed, into which the liquid slips, and so gradually gets between the stopper and the neck of the bottle, and allows of the former being easily withdrawn. Another method is to use a stopper extractor. This can easily be made out of a block of wood three inches square and two inches thick, by cutting a hole through its centre large enough to receive the head of a stopper of a forty-ounce wide-mouthed shop round. The use of the above is preferable to pulling out two drawers, sticking the head of the stopper between them, and twisting the bottle round. as this latter method has a tendency to mark the shop fittings, which does not improve their appearance. To apply the extractor, it is placed over the stopper and grasped firmly in one hand, while the neck of the bottle is held by the other. A gentle, but firm and steady, twisting motion is then used, care being taken to keep both hands moving in the same plane, but in opposite directions. If the pressure be applied too vigorously or spasmodically, or if the lines of the direction of the opposite forces be not quite parallel, there is a danger of wrenching off the head of the stopper or breaking the neck of the bottle. If either or both of these methods fail, the application of heat may be tried. This may either be induced by friction, by means of a string passed once round the neck of the bottle and drawn rapidly backward and forward, the bottle being held fast meanwhile; or it may be applied by dipping the corner of a towel in hot water, squeezing, and wrapping it round the neck of the bottle, and repeating this at short intervals. When the glass has sufficiently expanded, the stopper should be immediately removed, and not be inserted till the bottle has cooled. By one or other of these methods, or a combination of them, together with patience and perseverance, the most intractable stopper may be drawn.

PRINTING WITHOUT A FRAME.

During the year an appliance for printing has been introduced by Mr. C. D. Durnford, the nature of which is as follows:—

Two pieces of flat wood are hinged together so as to open out and present a flat surface of or about the size of the negatives from which the prints are to be taken. The front surfaces of these pieces of wood are covered with cloth or other soft material, the whole forming a cushion on which the negative and prepared paper can rest. Across the back of each half cushion is attached a metal spring, such as is now commonly used for keeping the backs of ordinary printing frames in their places. At the ends of each spring are formed or attached gripping arrangements which, when drawn over or turned over the side of the cushion, clasp the edge of the front surface, keeping the spring in tension.

USEFUL RECEIPTS.

To Make Water Colours Flow on a Photograph.—The greasy surface of an albumenised print not unfrequently repels water colours when applied to them. While prepared ox-gall will ensure their smooth flowing, one of the simplest and best methods of treating the print is to apply the tongue to the surface. After this dries the colours will afterwards 'take' to the surface and flow evenly.

To Bleach Engravings.—Immerse the prints for one minute in Javelle water, and then wash thoroughly in water containing a little hyposulphite of soda. To prepare the Javelle water take four pounds of bicarbonate of soda and one pound of chloride of lime, put the soda in a kettle over the fire, add one gallon of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. When cold the liquid can be kept in a jug or bottle ready for use.

To Clean Paint Brushes.—When a paint brush is stiff and hard through drying with paint on it, put some turpentine in a shallow dish and set on fire. Let it burn for a minute until hot, then smother the flame and work the pencil in the fingers, dipping it frequently into hot spirits. Rinse all paint brushes, pencils, &c., in turpentine, grease with a mixture of sweet oil and tallow, to prevent them from drying hard, and put them away in a close box.

To Make Ink for Labels that will not be Affected by Acids.—Make a mixture of one part pure Trinidad asphaltum, with four parts of oil of turpentine, coloured with plumbago.

Removal of Oil Stains.—Mix pipe-clay or fullers' earth with cold water to a paste, and apply some of it to the soiled spot, without friction, so as not to injure the design. After having remained there for about twelve hours, it is removed and the remains brushed off. The porous material, after the water has evaporated, soaks up at least a portion of the oil. If the stain does not disappear by one application, it is to be repeated.

To Reduce Over-Printed Proofs.—Immerse the prints in a solution composed of five grains of cyanide of potassium and five drops of liquor ammonia to a pint of water. Allow them to remain until a sufficient degree of reduction has been effected and then wash carefully.

To Blacken the Brass Work of Lenses.—The diaphragms of lenses ought not to be blackened by the dead black varnish which is employed on the cells and the inside of the tube, as it would invariably chip off and produce a worse effect than if left untouched. They ought to be stained, by being first made quite clean and then receiving an application of a solution of nitrate of silver and nitrate of copper, heat being then applied.

To Identify Silver Chloride from Silver Cyanide.—In a mixture of silver cyanide and silver chloride, both constituents may be identified in the following way: If a particle of silver cyanide be examined by the microscope with a quarter-inch objective, it appears as an amorphous mass; but if a drop of ammonia be placed upon it and very gently warmed it will form distinct needle-like crystals. Silver chloride treated in the same way gives very minute octahedra.

To Dry a Gelatine Negative Quickly.—After being fixed and well washed lay the negative, face up, on a sheet of blotting-paper, and covering it with another sheet of blotting-paper, rub the hand all over the surface until the negative is surface dry. Then place it in a current of air for a few minutes. A cambric handkerchief or soft towel will answer instead of blotting-paper. If the negative be immersed in alcohol it will absorb and displace the water in the film, and thus permit of a quick drying by the agency of heat if necessary.

To Remove a Cork from the Inside of a Bottle.—With a stout string projected into the bottle, turn the bottle around until the cork is caught in a loop of the string, and with force pull out the cork.

Ink Stains on Prints or Books.—These may, in the majority of cases, be removed by applying a solution of muriatic acid, oxalic acid, or salt of sorrel (binoxalate of potash). After the stains disappear wash very thoroughly in water, and dry.

Dissolving Shellac in Ammonia.—Place the vessel containing the lac into a larger vessel with hot water. Pour boiling water on the lac, after which add ammonia, slowly, but continuously, stirring all the while with a glass rod until solution is effected. Excess of ammonia colours the solution brown.

To Test Gold or Silver.—Make the surface of the metal quite clean, by scraping or otherwise, and touch it with a solution of nitrate of silver. If the metal is unaffected and remains uncoloured, it may be assumed to be either gold or silver; if it blackens immediately, it proves it to be brass or metal of the baser order.

To Prepare an Illustration for the Lantern.—A lecturer may prepare a diagram in a few minutes by coating thin glass or mica with benzole varnish to which a few drops of indiarubber solution has been added. This dries transparent, but allows of the finest writing being made on it by means of a steel pen and India ink. By placing it upon an engraving the leading features may be quickly and accurately traced in outline.

To Strengthen Alcohol.—Pour it into a clear glass bottle, and add a tablespoonful of finely-powdered and well-dried carbonate of potash. Now cork the bottle and shake well up for a couple of minutes. Allow to settle, and in a few minutes the water which was mixed with the alcohol will be found at the bottom, united with a portion of the potash, the superfluous portion of which will also be precipitated, leaving the alcohol clear and strong.

Removing Rust from a Lens.—A lens sometimes acquires a brown, rusty stain on the surface, which no amount of rubbing or cleaning will remove. By applying a paste composed of putty powder and water to the stains, and then rubbing briskly with either the point of the finger or the side of the hand, every spot of rust or stain will be removed in a few minutes. This applies to photographic or other lenses, except the object glass of a telescope, which would be irreparably damaged by such treatment.

To Prepare Ox-gall for Artistic or Scientific Purposes.—Procure from a butcher half a pint of ox-gall. Place this in a clean saucepan and add an ounce of powdered alum and an ounce of common salt. Place over the fire, and when it boils remove for half an hour to cool; then boil again, and repeat this boiling and cooling for three or four times. After this allow it to settle for three or four hours, and decant off into a bottle, in which put two or three drops of essence of lemon. Cork and preserve for use.

Delicate Test for Hyposulphite in Card Mounts.—Cut three or four square inches of the suspected card into small pieces and place in a beaker with a few scraps of granulated zinc; fill half full of water, and add about half a drachm of sulphuric acid. *Quickly* cover the beaker with a round piece of filtering-paper, bending it under the edges of the beaker, and let fall a drop or two of a solution of sugar of lead upon the filtering-paper. Set it aside for half an hour, and if there has been any hyposulphite in the paper the sugar-of-lead solution will have left a brown stain. This test shows the presence of an infinitesimal portion of hyposulphite. The more of it that is present the quicker is the stain produced.

Dry Pocket Glue.—Dry pocket glue is made from twelve parts of glue and five parts of sugar. The glue is boiled until entirely dissolved, the sugar dissolved in the hot glue, and the mass evaporated until it hardens on cooling. The hard substance dissolves rapidly in lukewarm water, and is an excellent glue for use on paper.

Useful Paste.—Place five pounds of potato starch in six pounds of water, and add one quarter pound of pure nitric acid. Keep it in a warm place, stirring frequently for forty-eight hours. Then boil the mixture until it forms a thick and translucent substance. Dilute with water, if necessary, and filter through a thick cloth. At the same time, another paste is made from sugar and gum arabic. Dissolve five pounds gum arabic and one pound of sugar in five pounds of water, and add one ounce of nitric acid and heat to boiling. Then mix the above with the starch paste. The resultant paste is liquid, does not mould, and dries on paper with a gloss. It may be employed for every purpose in photography except mounting silver prints.

India Ink for drawing may be improved so that even the thickest lines will quickly dry, by adding one part of carbolic acid to eight of the India ink. If too much is added it may be rectified by putting in more India ink. If the mixture is properly formed the ink is as easy to draw with as it is without carbolic acid, but dries quickly, and may even be varnished without discharging.

To Recover Silver Bromide from Waste Emulsion.—Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

To Deposit Gold upon Steel.—Make a solution of chloride of gold, the strength being immaterial, provided it be not too weak. We have always preferred having as little water as possible. Into this solution pour sulphuric ether, and, having replaced the stopper of the bottle, shake the mixture well up, when it will be found that the gold has left the water and entered into combination with the ether. Upon immersing a piece of bright polished steel—such as the blade of a knife—in this, it will instantly become coated with metallic gold.

Artificial Ivory for Photographs.—One of several methods of making artificial ivory slabs for portraits consists in mixing together sulphate of baryta with gelatine or albumen, compressing the product into sheets and drying it.

Collodion for Decayed Teeth.—If ten parts of collodion are added to fifteen parts of creosote a sort of jelly is obtained which is more convenient to apply to decayed teeth than creosote in the liquid form.

Paraffine Lamps for the Developing Room.—The upper part of a paraffine oil lamp after standing for a short time frequently gets oily from the condensation of the vapour of the oil. This may be prevented by taking a piece of felt and cutting a hole in it so as to fit exactly round the socket into which the burner is screwed; trim the felt off so as to leave a rim about half an inch wide, and place this felt ring on the socket.

To Clean Paraffine Developing Lamps.—Wash the lamp inside and out thoroughly with hot water and soap and a little washing soda. When clean, rinse repeatedly so as to leave no trace of soap; let it drain till dry.

Freckles.—These, especially in summer, cause portrait photographers much trouble, for they are invariably more pronounced in the negative than on the face of the sitter. They may be mitigated in a considerable degree by bathing the face in very warm water immediately before sitting. A still more successful way to prevent their appearance on the negative is to get the sitter to apply puff powder of a yellow colour to his or her face. Common violet powder will answer if with it be mixed any harmless yellow powder. Freckles are *said* to be removed by a mixture of three grains of borax in five drachms each of rose water and orange-flower water, applied every night; but we do not believe that it will prove efficacious even if the application were carried on for years.

Freezing Mixture.—While the simplest and most economical freezing mixture consists in dissolving one ounce of nitrate of ammonia in an ounce of water, a far more powerful one consists in adding to the foregoing carbonate of soda, the soda, ammonia, and water, being in equal parts. But in this latter case the nitrate of ammonia cannot be recovered, whereas in the former case it can. When access to snow or powdered ice is had, while the simplest mixture is two parts of either of these and one part of common salt, the most efficacious mixture consists of twelve parts of snow or ice, five parts of nitrate of ammonia and five parts of common salt. These will cause a thermometer to sink twenty-five degrees below zero (Fahr.).

To Ascertain the Strength of a Silver Solution.—If the solution contain nothing but nitrate of silver then may the argento-hydrometer be employed in the certainty of its affording a fairly accurate idea of the number of grains of the salt contained in each ounce of water. But this specific-gravity test quite fails in the case of a silver solution which, from having been long in use, contains other matters. In this case a test solution composed of pure chloride of sodium eight and a half grains, dissolved in six ounces of distilled water, must be prepared. To use it, place one drachm of the bath solution in a two-ounce bottle, rinsing out the minim measure with a drachm of distilled water and adding to the other. Pour in the salt solution slowly and with occasional shaking until no further precipitate takes place. Having noted how many drachms it has taken to effect this end, multiply this number by four for the weight in grains of the nitrate of silver present in an ounce of the bath solution. If pure chloride of sodium be not procurable, commercial chloride of ammonia may be substituted, seven and three-quarter grains being dissolved in six ounces of water.

A Brilliant Black Varnish for iron, stone, or wood can be made by thoroughly incorporating ivory black with common shellac varnish. The mixture should be laid on very thin. But ordinary coal-tar varnish will serve the same purpose in most cases quite as well, and it is not nearly so expensive.

To Prevent Unmounted Photographs from Curling.—A more correct heading of this receipt would perhaps be to 'flatten prints after they are curled.' Lay the photograph face down upon a pad composed of several sheets of paper, and place upon it at the left-hand margin a straight and rather sharp edge of a smooth ivory or boxwood rule. Move the rule slowly to the right, and with the left hand raise up the margin of the print nearest to that hand, pulling up rather strongly, yet so as not to allow the print to drag over the pad upon which it is laid. This will flatten the print and remove any further tendency to curl.

Removing Greasiness from Prints.—It is frequently the case that when water colours are to be applied to a print on albumenised paper, there is such a greasy repellent action set up as to prevent this from being done. This tendency may be entirely cured by applying the tongue to the surface of the print.

To Make Paper Waterproof.—Make a strong solution of Castile soap, and with it paint the paper or other material that is to be waterproofed. When nearly dry, paint it over again with a strong solution of chrome alum.

Packing Wet Plates.—A good way of packing plates, whether wet or dry, so as to preserve their films from danger, even if wet, consists in taking a small square of American cloth, cutting out one of the triangles formed by its diagonals, doubling it over and gluing. It is better to make them rather larger than necessary, and then cut them to the required size.

To Identify a Criminal by Photography.—Take a sharp photograph of the palm of one hand, placed in a strong oblique light, so as to bring out the markings forcibly. This gives a map which is never alike in two persons, and which no disguise short of actual disfigurement could do away with.

To Photograph on Silk.—Immerse the silk in

Water	1 ounce.
Gelatine	5 grains.
Chloride of sodium	5 ,,

Hang it up to dry; then float for half a minute on a fifty-grain solution of nitrate of silver; dry, print, tone, and fix, as usual.

REMOVAL OF INK STAINS FROM PHOTOGRAPHS.—Much, of course, depends upon the nature of the ink by which the stains were produced; but, assuming it to be the time-honoured gallate of iron ink, dissolve a drachm of oxalic acid in an ounce of warm water, and having wetted the surface of the print with warm water, apply the solution to the spot and rub gently until it disappears. Keep it warm throughout. Wash thoroughly and dry.

ANOTHER METHOD.—These may be removed by applying hydrochloric. If the photograph has been properly toned it will sustain no damage.

TO MAKE SULPHIDE OF POTASSIUM.—This compound, known popularly as 'liver of sulphur,' may be prepared by fusing together one part of sulphur and four parts of carbonate of potash. When cold, the mass should be broken up and kept in a wide-mouthed, corked bottle. Its photographic uses are too well known to require mention here.

RESTORING DISCOLOURED NEGATIVES.—When the varnish of a negative becomes discoloured from long use and exposure, and the printing qualities become consequently impaired, lay it down, face up, in a flat dish, and pour over it some alcohol, waving it backwards and forwards over the plate by gentle tilting. In two or three minutes the varnish will be removed. Wash with fresh alcohol, dry, and revarnish.

POLISHING BRASS.—For polishing brass, rub the surface with rottenstone and sweet oil, then rub off with cotton flannel, and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon renders the metal bright. Wash off the acid with water, and rub the brass with whiting and soft leather.

TO PREPARE A NEGATIVE FOR RETOUCHING.—Mix as follows:—

Gum dammar	6 grains.
Turpentine (rectified)	1 ounce.

When dissolved, filter through absorptive cotton, and apply this to the film all over with a piece of washleather. This medium is also very good used after varnishing as an ordinary retouching medium. A weak solution of resin in turpentine (about fifteen grains to the ounce) will also answer well.

TEST FOR NITRIC ACID.—The ever-useful pyrogallic acid has been put to a new purpose, a test for nitric acid, and it is stated to be capable of detecting it in water when present in so small a proportion as one in ten million parts. A small quantity (half a grain to the ounce) is dissolved in the water to be tested, and ten or twelve drops of strong sulphuric acid allowed to trickle down the side of the test-tube so as to form two layers; at their surface of contact a brown or yellow coloration is produced if nitric acid be present.

TO MEASURE THE ANGLE OF VIEW INCLUDED ON A PLATE.—Having spread on a table a large sheet of paper, draw on it a straight line equal to the length of the plate that is to be used, eight inches for an 8 × 5 plate, ten inches for a 10 × 8 plate, and so forth. Now, from the centre of this line erect a vertical line a little longer than the focus of the longest of the series of lenses that are to be subjected to this examination. With a foot-rule measure off from the base line the focus of the lens, and put a mark on the vertical line, and then with a pencil draw lines from this mark to each end of the base line first made. If there are more lenses than one to be thus determined, then let this measurement on the central line, followed by the extension lines to the ends of the base line, be made in every case, and each angle thus made by the pencil will represent the angle of view included on the plate by that particular lens which was instrumental in having such angular markings effected. To *measure* the angles thus obtained, place a protractor so that its centre or zero coincides with that mark on the vertical line upon the sheet of paper, and note where the diverging pencil lines touch the scale on either side, and enter the figures in the note-book as the angular covering power of that lens on that size of plate.

To Preserve Gum Water.—After dissolving gum arabic in warm water to any strength desired, add to it a small lump of camphor. This prevents it from becoming sour.

Cement (Opticians').—Resin, one pound; melt, and add dry plaster of Paris, four ounces.

To Make Tracing Paper.—Brush tissue-paper over with a mixture of equal parts of mastic varnish and oil of turpentine, and hang up to dry. Canada balsam thinned by turpentine also serves the purpose.

To Make Starch Paste keep Good for Several Days.—Starch, one drachm; water, one ounce. Mix and heat over boiling water till turned, then add half a drachm of glycerine.

To Separate Gelatine Films from Glass.—This may be done by immersing the negative for some time in greatly diluted hydrofluoric or hydrochloric acid. To ensure success, the negative should be treated with chrome alum, then washed and dried before the application of the acid.

Varnish for Restoring Whitened German Gold Frames.—Reduce thirty grains of gamboge and half an ounce of dragon's blood to coarse powder, and add to thirty grains of turmeric powder, and two and a half ounces each of shellac and sandarac. Place in a bottle with a pint of turpentine, and, keeping it in a warm place for fourteen days, shake at intervals. Filter, and add four ounces of mastic varnish. This is to be applied with a brush to metal-coated frames.

Varnish Making.—The basis of white-hard varnish is generally understood to be sandarac, and that of brown-hard shellac. It frequently happens, in diluting either variety with methylated spirit, that a turbidity is caused owing to a slight precipitation of a portion of the resin. This may arise from the spirit not being strong enough. Should this, however, not be the cause, the turbidity may generally be removed by the addition of a small quantity of turpentine.

Rice Glue.—Mix rice flour with cold water, and gently simmer it over the fire, when it readily forms a delicate and durable glue.

Portable or Mouth Glue.—Fine pale glue one pound, dissolve over a water bath in sufficient water, add brown sugar quarter of a pound, continue the heat till amalgamation is effected; pour on a slab of slate or marble, and, when cold, cut into squares.

Marine Glue.—1. Dissolve by heat one part of pure indiarubber in naphtha, when melted, add two parts shellac; melt until mixed, pour while hot on metal plates to cool. When required to use melt and apply with a brush. 2. Caoutchouc twenty grains, chloroform two fluid ounces, dissolve and add four drachms of powdered mastic, let it macerate for a week; must be kept cool and well corked.

To Remove Silver Stains from Gelatine Negatives.—Remove the varnish and apply the following:—

A.	Sulphocyanide of ammonia	½ drachm.
	Water	1 ounce.
B.	Nitric acid	½ drachm.
	Water	1 ounce.

A freshly-mixed solution being used for each negative. This is followed, after washing, by the application of a saturated solution of chrome alum.

Glazing Gelatine Prints.—The use of highly hand-polished sheet vulcanite rubber for imparting a high gloss to the surface of gelatino-bromide prints is now well known, but, in consequence of the difficulty in obtaining good samples, and of its high cost, the general use of it has been somewhat limited. A substitute, in the shape of ferrotype plates, costing but a mere fraction of the rubber, has been recently tried with success. Upon the smooth, varnished side of the sheet is laid the moist print, film side down. It is then squeegeed by passing a rubber roller over the back, which presses out all the air bells. In an hour or so the print, when dry, can be pulled off at one corner, and will possess a high gloss. A slight heat applied on the rough side of the metal sheet will materially hasten the drying.—*Scientific American.*

A Quick Filter.—Take a clear piece of chamois-skin, free from thin places, cut it of the desired size, wash it in a weak solution of soda or any alkali to remove the grease, and rinse thoroughly in cold water before using. Tinctures, elixirs, syrups, and even mucilages are filtered rapidly. A pint of the thickest syrup will run through in four or five minutes. By washing thoroughly after each time of using it will last a long time.

Bookbinders' Paste.—Place half a quartern of flour in a saucepan, put as much cold water on it as will cover it, and stir it well up, so as to break all the lumps while in a state of dough. Then pour about two quarts of cold water and one ounce of powdered alum. Stir well, and boil till it is thick.

Waterproof Paper.—Dissolve eight ounces of alum and three and three-quarters ounces of Castile soap in four pints of water, and two ounces of gum arabic and four ounces of blue, separately, in four pints of water. Mix the solutions, heat slightly, dip in the single sheets, and hang up to dry.

To Convert Photographs into Line Drawings.—There are two methods by which a photograph can be prepared for the purpose referred to. The first consists in printing the photograph in the usual way on either plain or albumenised paper and fixing it, care being taken not to tone it with gold. When washed and dried the image is of a brown colour. This must be gone over with a steel pen charged with very black ink, so as to ensure the chief features in the photograph being translated into lines more or less thick. When the drawing is completed the paper is floated upon a solution of bichloride of mercury, by which the photograph disappears in consequence of its bleaching, leaving the ink lines. From this drawing a negative is made. The second method consists in sensitising the paper by sponging it over with ammonio-oxalate or citrate of iron, exposing under the negative, and developing with a wash of potassium ferrid-cyanide. This gives an image, in a blue colour, which does not require to be removed in the after-process of producing a negative from the pen-and-ink drawing.

To Bleach Discoloured Prints.—The soiled paper, print, or engraving, is to be first placed in a bath composed of a quarter of a pound of chloride of lime, and the same of soda, to about a quart of water, and allowed to remain till the paper has regained its proper tint. Next, it is removed with the utmost care into a dish of cold running water, and allowed to remain for at least six hours—the chloride of lime being by that time removed. When the paper is thoroughly dry by exposure, it must be dipped into a third bath of size and water, which will restore its firmness. Finally it is placed between printers' glazed-boards and passed through a press, which will restore the original smooth surface, in which condition it will be suitable for photographing. If prints are stained by oil, grease, coffee, candle drippings, or ink, different treatment will be needed. Hydrochloric acid, diluted with five times its bulk of water, forms the first bath, and into it the engraving is placed, for not longer than four minutes, and then carefully washed as above. A grease spot is to be removed by placing the sheet between two pieces of blotting-paper, or covering with powdered talc, and applying a heated iron to the spot, which will melt the grease and cause it to be at once soaked up by the porous paper. Dirty finger-marks are to be removed by covering them over with a piece of clean yellow soap for two or three hours, and then washing with a sponge and hot water. The sheet is afterwards dipped in weak acid and water, followed by another hot-water bath, and ultimately by cold water. Ink stains are to be destroyed by dipping the paper into a strong solution of oxalic acid, and then into one of hydrochloric acid and water (one to six); finally, the usual continuous cold bath.

To Cement Lenses.—Although I never recommend photographers to meddle more with their lenses than they can help, yet in some, especially those of foreign make, an arborescent appearance is occasionally to be seen between the elementary parts of which the lens is composed. This arises from the drying or shrinking of the balsam with which it is cemented. To remedy this, unset the lens, place it in warm water, which may be still further heated till the balsam softens, separate the components, and clean with ether, benzole, or turpentine. Next place a drop of pure balsam on the centre of the concave surface, and gently press the convex one down upon it until the balsam spreads and oozes out at the edges. Then apply a gentle heat until the balsam is found to have been hardened.

FORMULÆ.

THE WET COLLODION PROCESS.

Iodised Collodion (for Negatives).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	8 ,,
Pyroxyline	120 grains.
Iodide of ammonium	12 ,,
,, cadmium	20 ,,

Bromo-Iodised Collodion (for Negatives).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	10 ,,
Pyroxyline	120 grains.
Iodide of ammonium	40 ,,
,, cadmium	40 ,,
Bromide of ,,	20 ,,

Bromo-Iodised Collodion (for Positives or Ferrotypes).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	10 ,,
Pyroxyline	100 grains.
Iodide of cadmium	50 ,,
Bromide of ammonium	20 ,,

The Nitrate Bath (for Negatives).

Nitrate of silver (recrystallised)	6 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	10 minims.

Saturate with iodide of silver and filter.

(For Positives or Ferrotypes).

Nitrate of silver (recrystallised)	5 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	12 minims.

Saturate with iodide of silver and filter.

THOMAS'S PLATES.

IMPROVEMENTS IN MANUFACTURE.

REDUCTION IN PRICE.

DEVELOPER.

FOR NEGATIVES.

No. 1

Protosulphate of iron	¼ ounce.
Glacial acetic acid	¼ ,,
Alcohol	½ ,,
Water	8 ounces.

No. 2.

Protosulphate of iron	15 grains.
Acetate of soda	15 ,,
Glacial acetic acid	30 minims.
Alcohol	30 ,,
Water	1 ounce.

No. 3.

Protosulphate of iron	1 ounce.
Glacial acetic acid	1 ,,
Citric acid	½ drachm.
Water	1 pint.

No. 4.

Ammonio-sulphate of iron	75 grains.
Glacial acetic acid	75 ,,
Sulphate of copper	7 ,,
Water	3 ounces.

No. 5.

Protosulphate of iron	7 drachms.
Water	20 ounces.
Collocine	2 small drops.
Alcohol	*quant. suff.*

This developer can also be used for glass positives and ferrotypes.

FOR COLLODION POSITIVES OR FERROTYPES.

Protosulphate of iron	1½ ounce.
Nitrate of baryta	1 ,,
Water	1 pint.
Alcohol	1 ounce.
Nitric acid	40 drops.

THOMAS'S PLATES
(The Pall Mall)
ARE MADE IN THREE RAPIDITIES
LANDSCAPE, RAPID, EXTRA RAPID.

For Collodion Transfers.

Pyrogallic acid	5 grains.
Citric acid	3 ,,
Acetic acid	45 minims.
Water	1 ounce.
Alcohol	*quant. suff.*

Intensifying Solution.

A.—Pyrogallic acid	3 grains.
Water	1 ounce.
B.—Nitrate of silver	10 grains.
Citric acid	20 ,,
Acetic acid	1 drachm.
Water	1 ounce.

For use mix a few drops of B with enough of A to cover the surface of the plate.

DRY COLLODION PROCESSES.

PYROXYLINE.

For Collodio-Bromide or Unwashed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	4 ,,
Water	1 ,,
Cotton (cleaned and carded)	100 grains.
Temperature	150° Fahr.
Time of immersion	10 minutes.

For Washed Emulsion.

No. 1.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	6 ,,
Water	1 ,,
Cotton (cleaned and carded)	100 grains.
Temperature	140° Fahr.
Time of immersion	10 minutes.

THOMAS'S PLATES.

Prices of the LANDSCAPE (15 Warnerke) Series.

4½ by 3¼, 1/2; 6½ by 4¾, 2/6; 8½ by 6½, 4/8; 10 by 8, 7/-;
12 by 10, 10/6 per Dozen.

No. 2.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	3 ,,
White blotting-paper	145 grains.
Temperature	100° Fahr.
Time of immersion	30 minutes.

COLLODION.

For Collodio-Bromide.

Ether, s.g. ·720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline	50 grains.
Bromide of cadmium and ammonium	80 ,,
or Bromide of zinc	76 ,,

Sensitise by adding to each ounce fifteen grains of nitrate of silver, dissolved in a few drops of water and one drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

* For Washed Emulsion (for Landscapes).

No. 1

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2¾ ,,
Pyroxyline	40 grains.
Castile soap (dissolved in alcohol)	30 ,,
Bromide of ammonium and cadmium	84 ,,

Sensitise with one hundred grains of nitrate of silver dissolved in one ounce of boiling alcohol; and after standing ten days, add a further twenty grains of silver dissolved as before in two drachms of alcohol.

* No. 2 (rapid).

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2½ ,,
Pyroxyline	40 grains.
Castile soap	30 ,,
Bromide of ammonium and cadmium	56 ,,

Sensitise with 125 grains of nitrate of silver, dissolved, as before, in one ounce of alcohol with the aid of heat. In twelve hours' time add thirty grains more of the double bromide of ammonium and cadmium dissolved in half an ounce of alcohol.

THOMAS'S PLATES.

Prices of the RAPID (20 Warnerke) Series.

4¼ by 3¼, **1/4**; 6½ by 4¾, **2/10**; 8½ by 6½, **5/4**; 10 by 8, **8/-**;
12 by 10, **12/-** per Dozen.

* For Washed Emulsion (for Transparencies).

Ether, s.g. 720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline or papyroxyline	60 grains.
Bromide of cadmium and ammonium	100 ,,
or Bromide of zinc	96 ,,
Hydrochloric acid, s.g. 1·2	8 minims.

Sensitise with twenty grains of nitrate of silver to each ounce, dissolved in a minimum of water with two drachms of boiling alcohol. Allow to stand for two or three days.

* N.B.—In the three last formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from twenty to twenty-four grains to the ounce of solvents.

ORGANIFIERS (for Unwashed Emulsions).

No. 1.

For Landscape Work.

Tannin	½ ounce.
Gallic acid	60 grains.
Water	20 fluid ounces.

No. 2.

Tannin	300 grains.
Water	20 fluid ounces.

No. 3.

For Landscapes or Transparencies (warm brown tone).

Freshly-ground coffee	1 ounce.
Boiling water	1 pint.

THOMAS'S PLATES.

Prices of the EXTRA RAPID (25 Warnerke) Series.

4¼ by 3¼, **1/6**; 6½ by 4¾, **3/2**; 8½ by 6½, **6/-**; 10 by 8, **9/-**;
12 by 10, **13/6** per Dozen.

No. 4.

For Transparencies (brownish-black tone).

Tannin	30 grains.
Pyrogallic acid	60 ,,
Water	20 fluid ounces.

DEVELOPING SOLUTIONS FOR COLLODION EMULSION.

SOLUTION A.

Pyrogallic acid	96 grains.
Alcohol	1 fluid ounce.

SOLUTION B.

Bromide of potassium	10 grains.
Water	1 fluid ounce.

SOLUTION C.

Liquor ammonia, s.g. ·880	1 fluid drachm.
Water	15 ,,

OR D.

Carbonate of ammonia	2 grains.
Water	1 fluid ounce.

For each drachm of developer take, for a normal exposure, five minims of A, one or two minims of B, and one or two minims of C, or, if D be used, add the above quantities of A, B, and C, to one drachm of D. When the details of the image are out, add double the quantities of B and C.

INTENSIFYING SOLUTIONS FOR COLLODION EMULSION.

Nitrate of silver	60 grains.
Citric acid	30 ,,
Nitric acid	30 minims.
Water	2 ounces.

To each drachm of a three-grain solution of pyrogallic acid add two or three minims of the above, and apply until sufficient density is attained.

THOMAS'S ∴ PLATES
(THE PALL MALL)
MANUFACTURED BY IMPROVED MACHINERY
IN A
FACTORY SPECIALLY BUILT FOR THE PURPOSE.

THE GELATINO-BROMIDE PROCESS.

DEVELOPING FORMULÆ.

WRATTEN AND WAINWRIGHT'S.

Ordinary.

A.—Pyro acid	2 grains,	Freshly mixed.
Water (ordinary)	1 ounce,	
B.—Bromide of potassium	15 grains.	
Water	1 ounce.	
C.—Liquor ammonia	1 drachm.	
Water	1 ounce.	

Development.—Lay the exposed plate in the dish in cold water (*hard*, not soft, water) for one minute, during which time pour into the developing cup one ounce of A. Pour off the water and apply the A, leaving it also on the film about one minute. Now drop into the cup (say) three minims or drops each of B and C, return A from the plate to the cup, and a perfect admixture will result. Reapply, and in about thirty seconds or so the image will begin to appear, and will gradually progress until the power of the developer is exhausted.

Instantaneous.—Stock Solution A.*

Ammonia liquor fort.	1 ounce.
Potass bromide	60 grains.
Water	3 ounces.

Developer.

Pyrogallic acid	3 grains.
Stock solution A*	20 drops.
Water	2 ounces.

Lay the exposed plate in a dish of cold water to soak while the pyrogallic acid is mixed. For each plate use at least three grains of pyro, diluted with two ounces of water. First pour off the water from the plate and apply the pyro solution; then add five drops of stock solution A*, and keep this weak developer on the plate until the highest lights are pretty well visible. Then add from fifteen to twenty drops more of A* to finish development.

JUBILEE YEAR.

The whole of Mr. H. N. KING'S Unique Series of

VIEWS of BUCKINGHAM & ST. JAMES'S PALACES

WERE TAKEN ON

THOMAS'S PLATES.

SWAN'S.

Alkaline Pyrogallic Acid Development.—For alkaline pyrogallic acid development we recommend as a good basis, to be modified according to the judgment and experience of the operator, the following:—

No. 1 Solution.

Pyrogallic acid	15 grains.
Water	10 ounces.

No. 2 Solution.

Liquor ammonia (·880 s.g.)	1 ounce.
Bromide of ammonium	1 "
Water	½ "

These two solutions are to be used in the proportion of one or two drops of No. 2 to each drachm of No. 1. A graduated dropping tube with indiarubber cap is the most convenient means of measuring No. 2 solution. Those who dislike the use of the dropping tube and prefer to employ solutions which can be mixed in equal proportions, may adopt the following formula:—

No. 1 Solution.

Pyrogallic acid	30 grains.
Water	10 ounces.

No. 2 Solution.

Liquor ammonia (·880 s.g.)	1 drachm.
Bromide of ammonium	1 "
Water	10 ounces.

If two ounces of developing mixture be required for developing a certain plate, then in using the second formula one ounce of each—No. 1 and No. 2 solutions—is taken.

NELSON'S.

Make two stock solutions, and label them No. 1 and No. 2.

No. 1.

Pyrogallic acid	1 ounce.
Methylated spirit	7 ounces.
Distilled water	3 "
White sugar	1 ounce.

SEND FOR A SPECIMEN PRINT OF

THE QUEEN'S PALACES.

8½ by 6½, 1/6; 12 by 10, 2/6 each.

TAKEN ON THOMAS'S PLATES.

No. 2.

Strong liquid ammonia, ·880	4 ounces.
Water	2 ,,
Bromide of ammonium	1 ounce.
White sugar	½ ,,

Have your developing cup and a four-ounce graduated measure quite clean, also an ebonite or wooden dish varnished with shellac, slightly larger than the plate being used, and two two-drachm minim measures, one of which is kept for No. 1 and the other for No. 2. To develope (say) a half-plate, put half a drachm of No. 1 into the developing glass, then put half a drachm of No. 2 into the graduated measure, and add one and a half ounce of water. Now lay the plate face upwards in the dish, pour the contents of the graduated measure into the developing cup, and flow the mixture steadily over the surface, avoiding air-bubbles; but should any adhere to the film at once remove them with the finger or clean camel's-hair brush. Gently rock the dish until the details are well out, which, if the exposure have been well timed, should be in about thirty seconds.

This answers equally for the ordinary and extra-rapid plates.

EDWARDS'S.

No. 1.

Pyrogallic acid	1 ounce.
Glycerine	1 ,,
Methylated alcohol	6 ounces.

Mix the glycerine and spirit and add the pyro.

No. 2.

Bromide of potassium (or ammonium)	60 grains.
Liquor ammonia, ·880	1 ounce.
Glycerine	1 ,,
Water	6 ounces.

The above stock solutions will keep any length of time.

To make the developer, add one part of No. 1 to fifteen parts of water, and label this bottle D (developer). In another bottle mix one ounce of No. 2 with fifteen ounces of water, and label it A (accelerator).

For use mix equal parts of D and A. For under-exposure increase the proportion of A, and *vice versâ*.

HOLLAND HOUSE.

SEND FOR A SPECIMEN PRINT OF THIS LOVELY PLACE.
'COUNTRY IN THE MIDST OF LONDON.'
8½ by 6½, 1/6; 12 by 10, 2/6 each.

THOMAS'S.

The Development.—Prepare the following solutions :—

A. P.

Acid pyrogallic	40 grains.
Distilled water	20 ounces.

A. P. must be freshly prepared.

A. B.

Liquor ammonia, s.g. ·800	½ ounce.
Ammonium bromide	100 grains.
Distilled water	20 ounces.

A. B. will keep several months.

Just a moment before development mix equal parts of the above solutions in sufficient quantity ; one ounce of each will be ample for a plate 8½ × 6½ in. Pass a broad camel's-hair brush over the plate to remove the slightest particle of dust, place it in a flat porcelain, glass, or ebonite tray, and flood it dexterously with the developer. The image quickly appears, and, if the correct exposure have been given, attains its full density in about a minute or a minute and a half; then wash freely with water.

☞ NOTE.—In case of under or over exposure, the development may be considerably modified by the judicious application of the A. P. and A. B. solutions. In case of over exposure add more of A. P.; for under exposure more of A. B. *A. P. gives density; A. B. brings out half tone.*

ROUCH'S.

Make the following solutions :—

A.

Pyrogallic acid	60 grains.
Nitric acid	3 to 5 minims.
Water	20 ounces.

B.

Liquor ammonia, ·880	1 ounce.
Bromide of potassium	2 drachms.
Water	2 ounces.

The solution B should be kept in an ordinary dropping-bottle. The object of nitric acid in the pyro solution is to give it keeping properties ;

LORD SALISBURY'S MANSION,
HATFIELD HOUSE.

SPECIMEN PRINTS FROM NEGATIVES ON
THOMAS'S PLATES.

it may be omitted where only a small quantity of solution is made for immediate use.

EASTMAN'S.

No. 1.

Sulphite sodium crystals (pure)	6 ounces.
Distilled or boiled water	1 quart.
Pyrogallic acid	1 ounce.

No. 2.

Carbonate soda (pure)	¼ pound.
Water	1 quart.

To develope take in a suitable tray—

No. 1	1 ounce.
No. 2	1 ,,
Water	1 ,,

Immerse the exposed plate in clean *cold* water, and with a soft camel's-hair brush gently remove the adhering air-bells from the surface. As soon as limp transfer to the developer, taking care to avoid bubbles by gently lowering the paper by one edge so as to slide it under the surface of the developer.

The image should appear in ten to twenty seconds, and the development should be carried on in the same way as for a glass dry plate. If the image appears too quick and is flat and full of detail add five to ten drops of the

Restrainer.—Bromide potassium	1 ounce.
Water	6 ounces.

This will keep back the shadows and allow the high lights to attain density.

If the exposure has been too short, and the image does not appear except in the highest lights, add, instead of the restrainer, not to exceed one ounce of No. 2; this will help to bring out the details and compensate, in a measure, for the short exposure. As soon as sufficient density is obtained, slightly rinse the negative and put in the

BEACH'S POTASH DEVELOPER.

Pyro Solution.

Warm distilled water	2 fluid ounces.
Sulphite of soda (pure)	2 ounces.

THOMAS'S PLATES.

ALL WHO HAVE NOT USED THEM SHOULD GIVE THEM A TRIAL.

When cold, add—

Sulphurous acid	2 fluid ounces.
Pyrogallic acid	½ ounce.

Potash Solution.

Carbonate of potash (pure)	3 ounces.
Sulphate of soda ,,	2 ,,
Water	7 fluid ounces.

Dissolve the salts separately and mix. For a plate having the normal exposure, mix the pyro and potash solutions in equal proportions. For under exposure use more of the potash solution, and *vice versâ*.

FORMULÆ FOR INTENSIFICATION.

EDWARDS'S.

Saturated solution of bichloride of mercury	10 ounces.
Iodide of potassium	10 drachms.

Dissolve the iodide of potassium in ten ounces of water, and pour gradually into the mercurial solution until the precipitate thrown down is *nearly* redissolved. Add one ounce of hyposulphite of soda in crystals.

ANOTHER.

Mercury bichloride	60 grains in	4	ounces	water.	
Iodide of potassium	90 ,,	2	,,	,,	
Hypo	120 ,,	2	,,	,,	Mix.

ENGLAND'S.

Mercuric chloride	20 grains.
Ammonium chloride	20 ,,
Water	1 ounce.

Wash the negative thoroughly after fixing, and apply the above until the film acquires a uniformly grey tint. Wash again, and apply a very weak solution of ammonia—ten drops of the latter to an ounce of water.

FOR SILVER INTENSIFICATION.

PYROGALLIC SOLUTION.

Pyro	15 grains.
Water	10 ounces.

THOMAS'S & PLATES.

SPECIALLY SUITABLE FOR INDIA & HOT CLIMATES.

Silver Solution.

Nitrate of silver	60 grains.
Citric acid	30 ,,
Nitric acid	30 minims.
Water	2 ounces.

To each ounce of the pyro solution add ten or fifteen minims of the acid silver, having previously thoroughly removed the hypo from the plate by prolonged washing, or by the use of the alum and hydrochloric solution. Should the shadows of the negative become stained during intensification, the solution of alum and acid will subsequently clear them almost instantaneously, unless the stain be due to the imperfect removal of the hypo. It must be borne in mind that the density increases greatly on drying the negative.

Radcliffe's.

Sulphate of iron and ammonia	1 ounce.
Lump sugar	1 ,,
Glacial acetic acid	2 ounces.
Albumen	1 ounce.
Distilled water	20 ounces.

Add the albumen last.

A few drops of a twenty-grain solution of silver nitrate are added at the time of using.

Wratten and Wainwright's.

A.

Protosulphate of iron	15 grains.
Gelatino-acetic acid solution (as described below)	40 drops.
Water	1 ounce.

B.

Nitrate of silver	10 grains.
Glacial acetic acid	10 drops.
Water	1 ounce.

THOMAS'S ALBUMENIZED PAPERS.
WHITE OR TINTED.

A Sample Packet, in quarter sheets, of Saxe or Rive, will be sent, pos paid, on receipt of 1*s.* in stamps. Sample Quire, 6*s.*; postage, 6*d.*

Photographers and the Trade supplied in Quantity on Wholesale Terms.
Quotations on Application.

The gelatino-acetic acid solution is compounded as under:—

Gelatine	15 grains.
Glacial acetic acid	3 drachms.
Water	5 ,,

It is as well to prepare a stock of this and also of A, as they are both better for keeping.

First flood the plate with water, and then with a solution of iodine and iodide of potassium of the colour of *pale* sherry for one minute; rinse it off and apply enough of A to cover the plate for the same time. Now drop into the cup a drachm of B, and bring the A back from the plate to the cup to mix them together. Reapply and keep moving over the surface until density is sufficient. If any air-bells should occur they must be kept moving, and then they will do no harm.

Jastrzembski's.

No. 1.

Gallic acid	1 part.
Alcohol	10 parts.

No. 2.

Nitrate of silver	1 part.
Water	16 parts.
Acetic acid	¼ to ½ of a part.

Both solutions are stable. Before using, mix one part of solution No. 1 with about four parts of distilled water, and then add a few drops of solution No. 2.

MISCELLANEOUS DRY PLATE FORMULÆ.

TO RESTORE FADED NEGATIVES.

Mr. W. E. Debenham recommends the following solution for the purpose of restoring printing force to negatives which have faded after mercurial intensification:—

Schlippe's salt	10 grains.
Water	1 ounce.

Wet the film thoroughly by soaking in a dish of water, and immerse in the restoring solution until the desired effect is obtained.

THOMAS'S ✢ SENSITIZED ✢ PAPERS.
WHITE OR TINTED.
KEEPS WELL, EXTREMELY SENSITIVE, TONES READILY.
Price, post free, per Sheet, 1s.; Quarter-Quire, 5s.;
Half-Quire, 8s.; Quire, 15s.

TO REMOVE THE LAST TRACES OF HYPO FROM THE FILM.

HYDROXYL.

Peroxyde of hydrogen (twenty vols.)	1 drachm.
Water..	5 ounces.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

ANOTHER.

Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others :—

Barium dioxide	1 ounce.
Glacial acetic acid	1 ,,
Water..	4 ounces.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

ALUM.

A simple plan brought forward by Captain Abney for this specific purpose consists in employing a saturated solution of alum in place of the solution of hydroxyl or peroxide of hydrogen.

EAU DE JAVELLE.

Dry chloride of lime (hypochlorite of lime)	2 ounces.
Carbonate of potash	4 ,,
Water..	40 ,,

Mix the chloride of lime with thirty ounces of the water ; dissolve the carbonate of potash in the remainder. Mix, boil, and filter.

LABARRAQUE'S SOLUTION.

Chloride of lime	2 ounces.
Carbonate of soda	4 ,,
Water...	40 ,,

Mix the chloride of lime with thirty ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil, and filter.

THOMAS'S BERLIN VARNISH.

Hard and Brilliant. Withstands a Tropical Sun.

Sold only in Capsuled Bottles.

Prepared with Pure Spirit: Per pint, 10/- ; half-pint, 5/- ; quarter-pint, 2/6.
Post free, per pint, 11/- ; half-pint, 5/9 ; quarter-pint, 3/ .

CLEARING SOLUTIONS FOR GELATINE NEGATIVES.

Cowell's.

Alum	2 ounces.
Citric acid	1 ounce.
Water	10 ounces.

Wash moderately after fixing, and immerse the negative in the above.

Another.

Saturated solution of alum	20 ounces.
Hydrochloric acid (commercial)	1 ounce.

Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

FERROUS CITRO-OXALATE DEVELOPER.

No. 1.	Potassium citrate	700 grains.
	Potassium oxalate	200 ,,
	Water	3½ ounces.
No. 2.	Ferrous sulphate	300 grains.
	Water	3½ ounces.

Mix in equal parts.

FORMULÆ FOR NEGATIVE VARNISH.

No. 1.

Sandarac	4 ounces.
Alcohol	28 ,,
Oil of lavender	3 ,,
Chloroform	5 drachms.

No. 2.

White hard varnish	15 ounces.
Methylated alcohol	25 ,,

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

THOMAS'S BERLIN VARNISH.

PREPARED WITH USUAL SPIRIT.

Per pint, 5/-; half-pint, 2/6; quarter-pint, 1/3.
Post free, per pint, 6/-; half-pint, 3/3; quarter-pint, 1/9.

No. 3.

Tough, hard, and durable :—

Shellac	1¼ ounce.
Mastic	¼ ,,
Oil of turpentine	¼ ,,
Sandarac	1¼ ,,
Venice turpentine	¼ ,,
Camphor	10 grains.
Alcohol	20 fluid ounces.

No. 4.

Sandarac	90 ounces.
Turpentine	36 ,,
Oil of lavender	10 ,,
Alcohol	500 ,,

No. 5.

This one may be rubbed down with powdered resin, and gives a splendid surface for retouching :—

Sandarac	2 ounces.
Seed lac	1 to 1½ ounce.
Castor oil	3 drachms.
Oil of lavender	1½ drachm.
Alcohol	18 fluid ounces.

No. 6.

Best orange shellac	1½ ounce.
Methylated alcohol	1 pint.

Keep in a warm place until dissolved; then add a large teaspoonful of whiting or prepared chalk; set aside to clear, and then decant. This is specially recommended for gelatine negatives.

NEGATIVE RETOUCHING VARNISH.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

THOMAS'S SPECIALTIES
FOR
DRY-PLATE WORKERS.

RUBY PAPER, LIQUID RUBY, INDIA-RUBBER SOLUTION,
ENCAUSTIC CERATE, &c.

GROUND-GLASS VARNISH.

Sandarac	90 grains.
Mastic	20 ,,
Ether	2 ounces.
Benzole	½ to 1½ ounce.

The proportion of the benzole added determines the nature of the matt obtained.

PRINTING FORMULÆ.

SELECTED TONING FORMULÆ.

No. 1.

Chloride of gold	1 grain.
Acetate of soda	30 grains.
Water	8 ounces.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

No. 2.

Chloride of gold	1 grain.
Bicarbonate of soda	4 grains.
Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

No. 3.

Chloride of gold	1 grain.
Phosphate of soda	20 grains.
Water	8 ounces.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

No. 4.

Gold solution	10 drachms.
Acetate of lime	20 grains.
Chloride of lime	1 grain.
Tepid water	20 ounces.

THOMAS'S LIQUID RUBY

Imparts to Paper or Glass a colour which renders it a Perfect Screen for the manipulation of the most sensitive Plates.

In bottles, 2-ounce, 1/- ; 5-ounce, 2/6 ; 10-ounce, 5/- ; 20-ounce, 10/-
Post free, ,, 1/3 ,, 2/9 ,, 5/9 ,, 11/-.

The 'gold solution' before mentioned is prepared by neutralising as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

No. 5.

Chloride of gold	15 grains.
Water	5 ounces.

Neutralise with lime water, make up to fifteen ounces with water, and add two drachms of chloride of calcium. This stock solution will keep for a long time for use. Dilute one ounce with ten ounces of water.

No. 6.

TONING AND FIXING IN ONE BATH.

Chloride of gold	1 grain.
Phosphate of soda	15 grains.
Sulphocyanide of ammonium	25 ,,
Hyposulphate of soda	240 ,,
Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces.
Water	16 ,,
Glycerine	1 ounce.
Methylated alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

ENCAUSTIC PASTE.

Pure wax	500 parts.
Gum elemi	10 ,,
Benzole	200 ,,
Essence of lavender	300 ,,
Oil of spike	15 ,,

THOMAS'S INDIA-RUBBER SOLUTION
FOR MOUNTING PHOTOGRAPHS.

Requires no Preparation. Is Ready for Immediate Use.

In bottles, 4-ounce, 1/- ; 8-ounce, 2/- ; pints, 4/-.
Post free ,, 1/3 ,, 2/6 ,, 4/9,

SENSITISING SOLUTION FOR CARBON TISSUE.

Bichromate of potash	1 ounce.
Water	20 ounces.
Liquor ammonia	6 minims.

WAXING SOLUTION.

For Carbon Prints, or for Removing Collodion Films.

No. 1.

Beeswax	20 grains.
Benzole rect. No. 1	4 ounces.

For Flexible Supports (Autotype).

No. 2.

Yellow resin	3 drachms.
Yellow beeswax	1 drachm.
Rectified spirits of turpentine	10 ounces.

THE 'DUSTING-ON' PROCESS.

No. 1.

Saturated solution of bichromate of ammonia	5 drachms.
Honey	3 ,,
Albumen	3 ,,
Distilled water	20 to 30 ,,

No. 2.

Dextrine	½ ounce.
Grape sugar	½ ,,
Bichromate	½ ,,
Water	½ pint.

THOMAS'S ENCAUSTIC CERATE

Renders Silver Prints more Permanent, and adds to the Beauty of their Appearance.

In bottles, 1/3, 2/6, 5/- each. Post free, 1/6, 2/9, 5/3 each.

No. 3.

Gum arabic	6 parts.
Bichromate of potash	2·5 ,,
Grape sugar	4 ,,
Water	72 ,,

No. 4.

Honey	4 drachms.
Glucose	8 ,,
Albumen	6 ,,
Dextrine	3 ,,
Bichromate of potash	8 ,,
Water	20 ounces.

MISCELLANEOUS FORMULÆ.

SOLUTIONS FOR SILVERING GLASS MIRRORS.

Martin's.

A.

Nitrate of silver	175 grains.
Distilled water	10 ounces.

B.

Nitrate of ammonia	262 grains.
Distilled water	10 ounces.

C.

Pure caustic potash	1 ounce (avoirdupois).
Distilled water	10 ounces.

THOMAS'S ∴ CHEMICALS
Have for many years been known to be the Purest made, and as such are found be the Most Economical.

FOR PRICES SEE CATALOGUE.

D.

Pure sugar candy	½ ounce (avoirdupois)
Distilled water	5 ounces.

Dissolve and add—

Tartaric acid	50 grains.

Boil in a flask for ten minutes, and when cool add—

Alcohol	1 ounce.

Distilled water *quant. suff.* to make up to 10 ounces.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

BURTON'S.

Solution 1.

Nitrate of silver	25 grains.
Distilled water	1 ounce.

Solution 2.

Potash (pure)	25 grains.
Distilled water	1 ounce.

Solution A.

Solution 1 Solution 2	equal parts.
Ammonia	to just dissolve the precipitate.
Solution 1	to just cause a discolouration.

Solution B.

Loaf sugar	2,700 grains.
Distilled water	20 ounces.
Nitric acid	2 drachms.
Alcohol (strong)	10 ounces.
Distilled water to make	80 ,,

For use—

Solution A	1 ounce.
Solution B	1 drachm.

Solution A is subject to slow decomposition; Solution B, on the contrary, improves by keeping.

THOMAS'S ∴ APPARATUS

IS OF THE FINEST WORKMANSHIP AND MOST DURABLE KIND MANUFACTURED.

SEND FOR PRICE LIST OF CAMERAS, &c.

WORTLEY'S COLLO-RESTRAINER.

Gelatine	3 drachms.

Soak in water for twenty-four hours; drain off water thoroughly, and add—

Sulphuric acid	7 drachms.

When cold add water seven ounces. Neutralise with liquor ammonia (it will take about two ounces), and then add—

Glycerine	4½ ounces.

CHROMOGRAPH MIXTURES.

Make a zinc tray about a quarter of an inch in depth, and pour into it a warm solution made as follows:—

Water	4 ounces.
Sulphate of baryta	2½ ,,
Sugar	1 ounce.
Gelatine	1 ,,
Glycerine	6 ounces.

Write whatever is required to be printed upon a sheet of white paper, using instead of ordinary ink the aniline colour known as 'violet of methylaniline;' as soon as the writing is pretty dry, lay it upon the gelatine surface and rub the back of the paper with the palm of the hand. The ink will be absorbed by the gelatinous product. All that is to be done in order to obtain a *facsimile* of the writing is to lay a sheet of paper upon the writing on the gelatine and rub the back with the hand. From forty to fifty can thus be drawn off in a few minutes.

INK FOR RUBBER STAMPS.

Aniline red (violet)	90 grains.
Boiling distilled water	1 ounce.
Glycerine	half a teaspoonful.
Treacle	half as much as glycerine.

EVERY PHOTOGRAPHIC REQUISITE *can be obtained from this, the Oldest Established House in the Trade.*

SEND FOR A CATALOGUE.

FREEZING MIXTURES.

The following mixtures will be found useful where ice is not readily obtainable—

	Ingredients.	Parts by Weight.	Temperature Produced Starting at 10°C.	Diminution of Temperature.
1	Water	1	16°C.	26°C.
	Nitrate of ammonia	1		
2	Water	16	12°	22°
	Saltpetre	5		
	Chloride of ammonium (sal ammoniac)	5		
3	Water	1	19°	29
	Nitrate of ammonia	1		
	Carbonate of soda	1		
4	Snow	5	..	20°
	Chloride of sodium	2	..	
5	Snow	1	..	45°
	Crystallised chloride of calcium	2	..	
6	Crystallised sulphate of soda	8	20°	30°
	Hydrochloric acid	5		

INLAND PARCELS POST.

Every Post Office is open to the public for Parcels Post business on Week Days during the same hours as for general postal business. On Sundays Parcels Post business is not transacted.

Rates of Postage and Weight.—Three halfpence for each pound after the first, which is threepence.

Prepayment of Postage.—All parcels must be prepaid. Limitation of Weight.—No Parcel exceeding 11 lbs. in weight can be received for transmission by Parcels Post. Limitation of Size.—No Parcel may exceed 3 ft. 6 in. in length, or 6 ft. in length and girth combined. Posting of Parcels.—Parcels must be handed in at a Post Office Counter, and must not be dropped into a Letter Box.

R. W. THOMAS & CO.

10 PALL MALL,

LONDON, S.W.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC, AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

NAME.		Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminium		Al^{iii}	27·4	9·13
Antimony (Stibium)		Sb^{iii}	122·0	40·66
Arsenic		As^{iii}	75·0	25·0
Barium		Ba^{ii}	137·0	68·5
Bismuth		Bi^{iii}	208·0	69·33
Boron		B^{iii}	11·0	3·66
Bromine		Br^{i}	80·0	80·0
Cadmium		Cd^{ii}	112·0	56·0
Cæsium		Cs^{i}	133·0	133·0
Calcium		Ca^{ii}	40·0	20·0
Carbon		C^{iv}	12·0	3·0
Cerium		Ce^{ii}	92·0	46·0
Chlorine		Cl^{i}	35·5	35·5
Chromium		Cr^{ii}	52·2	26·1
Cobalt		Co^{ii}	58·8	29·4
Columbium (or Niobium)		Cb^{v}	94·0	18·8
Copper (Cuprum)	Cuprosum	Cu^{i}	63·4	63·4
	Cupricum	Cu^{ii}	63·4	31·7
Davyum		Da	...	...
Didymium		Di^{ii}	95·0	47·5
Erbium		E^{ii}	112·6	56·3
Fluorine		Fl^{i}	19·0	19·0
Gallium		Ga	68·0	...
Glucinum		G^{ii}	9·4	4·7
Gold (Aurum)		Au^{iii}	196·0	65·33
Hydrogen		H^{i}	1·0	1·0
Indium		In^{iii}	113·4	37·8
Iodine		I^{i}	127·0	127·0
Iridium		Ir^{iv}	198·0	49·5
Iron (Ferrum)	Ferrosum	Fe^{ii}	56·0	28·0
	Ferricum	Fe^{iii}	56·0	18·66
Lanthanum		La^{ii}	92·8	46·4
Lead (Plumbum)		Pb^{ii}	207·0	103·5
Lithium		Li^{i}	7·0	7·0
Magnesium		Mg^{ii}	24·0	12·0
Manganese		Mn^{ii}	55·0	27·5
Mercury (Hydrargyrum)	Mercurosum	Hg	200·0	200·0
	Mercuricum	Hg^{ii}	200·0	100·0
Molybdenum		Mo^{ii}	92·0	46·0
Nickel		Ni^{ii}	58·8	29·4
Nitrogen		N^{iii}	14·0	4·66
Osmium		Os^{iv}	199·0	49·75
Oxygen		O^{ii}	16·0	8·0
Palladium		Pd^{ii}	106·5	53·25

TABLE OF SYMBOLS, &c.—CONTINUED.

NAME.		Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Phosphorous		P^{iii}	31·0	10·33
Platinum	Platinosum	Pt^{ii}	197·4	98·7
	Platinicum	Pt^{iv}	197·4	49·35
Potassium (Kalium)		K	39·1	39·1
Rhodium		Rh^{ii}	104·4	52·2
Rubidium		Rb^{i}	85·4	85·4
Ruthenium		Ru^{iv}	104·0	26·0
Selenium		Se^{ii}	79·4	39·7
Silicium (or Silicon)		Si^{iv}	28·0	7·0
Silver (Argentum)		Ag^{i}	108·0	108·0
Sodium (Natrium)		Na^{i}	23·0	23·0
Strontium		Sr^{ii}	87·5	43·75
Sulphur		S^{ii}	32·0	16·0
Tantalum		Ta^{v}	182·0	36·4
Tellurium		Te^{ii}	128·0	64·0
Thallium		Te^{i}	204·0	204·0
Thorium (or Thorinum)		Th^{iv}	231·5	57·87
Tin (Stannum)	Stannosum	Sn^{ii}	118·0	59·0
	Stannicum	Sn^{iv}	118·0	29·5
Titanium		Ti^{iv}	50·0	12·5
Tungsten (Wolfram)		W^{iv}	184·0	46·0
Uranium		Ur^{ii}	120·0	60·0
Vanadium		V^{iii}	51·3	17·1
Yttrium		Y^{ii}	61·7	30·85
Zinc		Zn^{ii}	65·2	32·6
Zirconium		Zr^{iv}	89·6	22·4

RATES OF POSTAGE FOR INLAND LETTERS.

THE rates of postage to be prepaid are as follow, viz. :—

For a letter not exceeding 1 oz.							1*d.*
,,	exceeding	1 oz.,	but not	exceeding	2	ozs.	1½*d.*
,,	,,	2	,,	,,	4	,,	2*d.*
,,	,,	4	,,	,,	6	,,	2½*d.*
,,	,,	6	,,	,,	8	,,	3*d.*
,,	,,	8	,,	,,	10	,,	3½*d.*
,,	,,	10	,,	,,	12	,,	4*d.*
,,	,,	12	,,	,,	14	,,	4½*d.*

And so on at the rate of ½*d.* for every additional two ounces.

TABLE OF SYMBOLS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

Name.	Symbol.	
Acid, Acetic (Cryst.)	$H, C_2 H_3 O_2$	60
,, Citric	$H_3, C_6 H_5 O_7 + H_2 O$	210
,, Formic	H, CHO_2	46
,, Gallic	$H, C_7 H_5 O_5$	170
,, Hydriodic	HI	128
,, Hydrobromic	$H Br$	81
,, Hydrochloric	$H Cl$	36·5
,, Hydrocyanic	$H CN$	27
,, Hydrosulphuric	$H_2 S$	34
,, Nitric	H, NO_3	63
,, Oxalic	$H_2 C_2 O_4 + 2 H_2 O$	126
,, Pyrogallic	$H_3 C_6 H_3 O_3$	126
,, Sulphuric	$H_2 SO_4$	98
,, Sulphurous	$H_2 SO_3$	82
,, Tannic	$H_4 C_{27} H_{18} O_{17}$	618
,, Tartaric	$H_4 C_4 H_2 O_6$	150
Alum (Potash)	$Al K (SO_4)_2 12 H_2 O$	474·5
Ammonium, Bromide	$NH_4 Br$	98
,, Carbonate	$(NH_4)_2 CO_3$	96
,, Chloride	$NH_4 Cl$	53·5
,, Iodide	$NH_4 I$	145
,, Nitrate	NH_4, NO_3	80
,, Sulphydrate of	NH_4, HS	51
,, Sulphocyanide of	NH_4, CNS	76
Barium, Bromide	$Ba Br_2$	297
,, Chloride (Cryst.)	$Ba, Cl_2 + 2 H_2 O$	244
,, Iodide	$Ba I_2$	391
,, Nitrate	$Ba, (NO_3)_2$	261
Cadmium, Bromide (Cryst.)	$Cd, Br_2 + 4 H_2 O$	344
,, Chloride	$Cd Cl_2$	183
,, Iodide	$Cd I_2$	366
Calcium, Bromide (Cryst.)	$Ca Br_2 + 4 H_2 O$	272
,, Carbonate	$Ca CO_3$	100
,, Chloride	$Ca Cl_2$	111
,, Iodide	$Ca I_2$	294
Copper, Bromide (cupric)	$Cu Br_2$	223·4
,, Chloride ,,	$Cu Cl_2 + Aq$	
,, Sulphate ,,	$Cu SO_4$	159·4
Gold, Terchloride	$Au Cl_3$	302·5
Iron, Chloride (ferrous)	$Fe Cl_2$	127
,, ,, (ferric)	$Fe_2 Cl_6$	325
,, Iodide	$Fe I_2$	310
,, Nitrate	$Fe (NO_3)_2 + 6 H_2 O$	288
,, Oxalate (ferrous)	$Fe C_2 O_4$	144
,, ,, (ferric)	$Fe_2 (C_2 O_4)_3$	376
,, Sulphate (ferrous)	$Fe SO_4 + 7 H_2 O$	278
,, ,, (ferric)	$Fe_2 (SO_4)_3$	400
,, Ammonia-sulphate	$Fe SO_4, (NH_4)_2 SO_4 + 6 H_2 O$...	392

TABLES OF SYMBOLS, &c.—CONTINUED.

NAME.	SYMBOL.	
Lead, Acetate (Cryst.)	$Pb, (C_2 H_3 O_2)_2 + H_2 O$	343
,, Nitrate	$Pb, (NO_3)_2$	331
Lithium, Bromide	$Li Br$	87
,, Chloride	$Li Cl$	42·5
,, Iodide	$Li I$	134
Magnesium, Bromide	$Mg Br_2$	184
,, Chloride	$Mg Cl_2$	95
,, Iodide	$Mg I_2$	278
Mercury, Chloride (Mercuric)	$Hg Cl_2$	271
Platinum, Chloride	$Pt Cl_4$	339
Potassium, Bichromate	$K_2 Cr_2 O_7$	294·6
,, Bromide	$K Br$	119·1
,, Carbonate	$K_2 CO_3$	138·2
,, Chloride	$K Cl$	74·6
,, Citrate	$K_3 C_6 H_5 O_7 + H_2 O$	324·3
,, Cyanide	$K C N$	65·1
,, Hydrate	$K OH$	56·1
,, Iodide	$K I$	166·1
,, Nitrate	$K NO_3$	101·1
,, Permanganate	$K_2 Mn_2 O_8$	316·2
Silver, Acetate	$Ag C_2 H_3 O_2$	167
,, Bromide	$Ag Br$	188
,, Carbonate	$Ag_2 CO_3$	276
,, Chloride	$Ag Cl$	143·5
,, Citrate	$Ag_3 C_6H_5O_7$	513
,, Fluoride	$Ag Fl$	127
,, Iodide	$Ag I$	235
,, Nitrate	$Ag NO_3$	170
,, Oxalate	$Ag_2 C_2 O_4$	304
,, Oxide	$Ag_2 O$	232
,, Sulphide	$Ag_2 S$	248
Sodium, Acetate (Cryst.)	$Na C_2 H_3 O_2 + 6 Aq$	190
,, Biborate (Borax)	$Na_2 B_4 O_7 + 10 H_2 O$	382
,, Bromide	$Na Br$	103
,, Carbonate (Cryst.)	$Na_2 CO_3 + 10 H_2 O$	286
,, Chloride	$Na Cl$	58·5
,, Citrate	$Na_3 C_6H_5O_7$	258
,, Hyposulphite (Cryst.)	$Na_2 S_2 O_3 + 5 H_2 O$	248
,, Iodide	$Na I$	150
,, Nitrate	$Na NO_3$	85
,, Sulphite	$Na_2 SO_3$	126
Strontium, Bromide	$Sr Br_2$	247·6
,, Chloride	$Sr Cl_2$	158·6
,, Iodide	$Sr I_2$	341·6
Uranium, Bromide	$U Br_2 4 H_2 O$	352
,, Nitrate	$(Ur O_2), (NO_3)_2 + 6 H_2 O$	384
Zinc, Bromide	$Zn Br_2$	225·2
,, Chloride	$Zn Cl_2$	136·2
,, Iodide	$Zn I_2$	319·2

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Acid, Boracic (Anhydrous)	47·01	...	2·13	soluble
,, ,, (Cryst.)	25·66	3·0	3·9	sol. in 6 parts @ 60°
,, Citric	0·75	0·5	133·0	sol. in 1·15 pt. s. g. 820
,, Gallic	100·0	3·0	1·0	soluble in 4 parts
,, Oxalic	15·5	1·0	6·47	insoluble
,, Pyrogallic	2·25	...	...	sol. in alc. and ether
,, Salicylic	87·2	vry sol	0·35	easily soluble
,, Succinic	5·0	2·2	20·0	soluble in 3 parts
,, Tannic	very	solubl	e	sol. in alc. and ether
,, Tartaric	·66	·5	150·0	soluble
Alum (Potash)	10·5	vry sol	9·52	insoluble
,, (Ammonia)	7·32	,,	13·66	,,
Ammonium, Bromide	1·4	0·78	41·1	sol. in 32·3 parts
,, Carbonate	3·3	·833	33·0	insoluble
,, Chloride	2·7	1·00	37·02	sparingly soluble
,, Citrate	deliqu	escent	vy. sol.	less sol. in alcohol
,, Iodide	very	solubl	e	soluble
,, Nitrate	2·0	1·0	50·0	freely soluble
,, Salicylate	very	solubl	e	
,, Succinate	,,	,,		
,, Sulphocyanide	deliqu	escent	easily	sol. in water and alc.
Barium, Bromide	·96	...	104·2	easily soluble
,, Chloride Crystallised	2·18	...	46·0	very slightly soluble
Anhydrous.	2·862	...	34·1	
,, Iodide	0·48	0·35	208·3	easily soluble
,, Nitrate	12·2	2·84	8·18	
Cadmium, Bromide	easily	solubl	e	easily soluble
,, Chloride	0·71	0·67	...	,,
,, Iodide	1·08	0·75	92·6	very soluble
Calcium, Bromide (Cryst.)	0·97	...	102·56	easily soluble
,, Chloride	0·25	any qy	400·0	
,, Iodide	deliqu	escent		
Cobalt, Chloride	very	solubl	e	sol. in alc. and ether
Copper, Bromide (Cupric)	deliqu	escent	vy. sol.	,, ,,
,, Chloride ,,	,,	,,	,,	,, ,,
,, Nitrate	solubl	e	...	very soluble
,, Sulphate	2·5	...	40·0	insoluble
Gold, Perchloride	deliqu	escent	vy. sol.	soluble in ether
Iron, Chloride Anhyd.	2·0	...	50·0	sol. in 1 part alcohol
(Ferrous) Hydrated	0·68	...	147·0	easily soluble

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Iron, Chloride (Ferric) ……	very del. & sol.			very soluble
,, Oxalate ,, ……	insoluble, except in excess of oxalic acid			
,, Sulphate ,, ……	soluble		…	soluble
,, ,, (Ferrous) …	1·3	·30	77·0	insoluble
Lead, Acetate ………………	3·7	3·45	27·0	soluble in 12·5 parts
,, Nitrate ………………	7·7	…	13·0	
Lithium, Bromide …………	0·66	…	149·8	soluble
,, Chloride …………	1·315	…	76·0	
,, Iodide ……………	0·61	…	164·0	
Magnesium, Bromide ……	deliquescent		vy. sol.	very soluble
,, Chloride ……	1·857	…	53·8	
,, Iodide ………	deliquescent		vy. sol.	soluble
,, Sulphate ……	1·47	0·66	68·04	slightly soluble
Mercury, Chloride ……… (Mercuric) ……………	16·0	3·0	6·25	soluble in 2·35 parts
Platinum, Bichloride………	soluble		…	easily sol. in alc. & ether
Potassium, Bichromate …	10·0	…	10·0	
,, Bromide ………	1·55	…	64·5	
,, Carbonate ……	0·9	…	111·0	
,, Chloride ………	3·03	2·0	33·0	slightly soluble
,, Citrate…………	very soluble			
,, Cyanide ………	deliquescent		vy. sol.	insol. in pure alcohol
,, Ferrocyanide …	3·0	1·0	33·3	insoluble
,, Ferricyanide …	2·54	1·22	39·37	very sparingly soluble
,, Hydrate ………	0·5	…	200·0	very soluble
,, Iodide …………	0·7	0·27	143·0	sol. in 40 pts. abs. alc.
,, Nitrate…………	3·5	0·4	28·57	insoluble
,, Nitrite …………	deliqu & soluble			
,, Oxalate(neutral)	3·0	…	33·3	slightly soluble
, ,, (bin.) …	40·0	…	2·5	insoluble
,, ,, (quad.)..	20·17	…	4·95	insoluble
,, Permanganate..	16·0	…	6·25	insoluble
,, Sulphocyanide..				
Silver, Acetate ……………	very slightly sol.			
,, Citrate………………	soluble in warm water			
,, Fluoride ……………	deliquescent			
,, Nitrate ……………	1·0	0·5	100·0	sol. in 4 pts. boiling alc.
,, Nitrite ……………	300·0	dissol. easily	0·33	insoluble
,, Oxalate …………	spar'ly sol.	soluble		insoluble

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Silver, Sulphate	200·0	88·0	0·5	insoluble
Sodium, Acetate (Cryst.)	2·86	·66	35·0	
,, Biborate (Borax)	12·44	2·0	8·033	insoluble
,, Bromide	1·13	...	88·5	
,, Carbonate (Cryst.)	2·0	1·0	50·0	insoluble
,, ,, (Anhyd.)	3·85	2·07	25·93	insoluble
,, Chloride	2·77	2·77	36·0	sparingly soluble
,, Citrate	1·0	...	100·0	sparingly soluble
,, Hydrate	1·65	...	60·63	easily soluble
,, Hyposulphite ... (Thiosulphate)	deliqu	escent	vy. sol.	insoluble
,, Iodide	0·55	0·3	180·0	sparingly soluble
,, Nitrate	1·136	...	88·03	sol. in 37 parts alc.
,, Nitrite	deliqu	escent	vy. sol.	very soluble
,, Phosphate	4·0	2·0	25·0	
,, Succinate	very s	oluble		
,, Sulphate	2·08	0·41	48·0	soluble
,, Sulphite	4·0	...	25·0	slightly soluble
,, Bisulphite	very s	oluble	...	insoluble
,, Sulphocyanide ...				
,, Tartrate	1·75	...	56·37	insoluble
,, Tungstate	4·0	2·0	25·0	
Strontium, Bromide	1·01	...	99·0	sparingly soluble
,, Chloride	1·88	...	53·0	feebly soluble
,, Iodide	0·56	0·27	178·5	
Uranium, Bromide ... (Hydrated)...	deliqu	& solu	ble	soluble
,, Nitrate	0·5	...	200·0	sol. in alc. and ether
,, Oxalate	nearly insol.	30·0	...	insoluble
Zinc, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	0·333	...	300·0	very soluble
,, Iodide	vy. de	liques.	& sol.	very soluble

Percentage of Real Ammonia in Solutions of different Densities at 14° Centigrade.—CARIUS.

Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9380	16·0	0·9709	7·0
0·8907	33·0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23·0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22·0	0·9484	13·0	0·9831	4·0
0·8976	30·0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0·9251	20·0	0·9556	11·0	0·9915	2·0
0·9026	28·0	0·9283	19·0	0·9593	10·0	0·9959	1·0

ALCOHOL.

Specific Gravities of Mixtures of Different Proportions of Alcohol (s.g. ·7932) and Water, by Weight and by Volume, at 14° R. (63·5° F.) Meissner.

Parts of		Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.	Parts of		Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.
Alcohol.	Water.			Alcohol.	Water.		
100	0	0·7932	0·7932	49	51	0·9196	0·9324
99	1	0·796	0·7969	48	52	0·9219	0·9344
98	2	0·7988	0·8006	47	53	0·9242	0·9364
97	3	0·8016	0·8042	46	54	0·9264	0·9384
96	4	0·8045	0·8078	45	55	0·928	0·9404
95	5	0·8074	0·8114	44	56	0·9308	0·9424
94	6	0·8104	0·815	43	57	0·9329	0·9443
93	7	0·8135	0·8185	42	58	0·9350	0·9461
92	8	0·8166	0·8219	41	59	0·9371	0·9478
91	9	0·8196	0·8253	40	60	0·9391	0·9495
90	10	0·8225	0·8286	39	61	0·9410	0·9512
89	11	0·8252	0·8317	38	62	0·9429	0·9529
88	12	0·8279	0·8346	37	63	0·9448	0·9547
87	13	0·8304	0·8373	36	64	0·9467	0·9564
86	14	0·8329	0·840	35	65	0·9486	0·958
85	15	0·8353	0·8427	34	66	0·9505	0·9595
84	16	0·8376	0·8454	33	67	0·9524	0·9609
83	17	0·8399	0·8581	32	68	0·9543	0·9621
82	18	0·8422	0·8508	31	69	0·9561	0·9632
81	19	0·8446	0·8534	30	70	0·9578	0·9643
80	20	0·847	0·8561	29	71	0·9594	0·9654
79	21	0·8494	0·8596	28	72	0·9608	0·9665
78	22	0·8519	0·8616	27	73	0·9621	0·9676
77	23	0·8543	0·8642	26	74	0·9634	0·9688
76	24	0·8567	0·8668	25	75	0·9647	0·970
75	25	0·859	0·8695	24	76	0·966	0·9712
74	26	0·8613	0·8723	23	77	0·9673	0·9723
73	27	0·8635	0·8751	22	78	0·9686	0·9734
72	28	0·8657	0·8779	21	79	0·9699	0·9745
71	29	0·868	0·8806	20	80	0·9712	0·9756
70	30	0·8704	0·8833	19	81	0·9725	0·9766
69	31	0·8729	0·886	18	82	0·9738	0·9775
68	32	0·8755	0·8885	17	83	0·9751	0·9784
67	33	0·8781	0·891	16	84	0·9763	0·9793
66	34	0·8806	0·8934	15	85	0·9795	0·9803
65	35	0·8831	0·8958	14	86	0·9786	0·9813
64	36	0·8855	0·8982	13	87	0·9796	0·9823
63	37	0·8879	0·9096	12	88	0·9806	0·9834
62	38	0·8902	0·9029	11	89	0·9817	0·9846
61	39	0·8925	0·9052	10	90	0·9830	0·9859
60	40	0·8948	0·9075	9	91	0·9844	0·9873
59	41	0·8971	0·9098	8	92	0·9860	0·9888
58	42	0·8994	0·9121	7	93	0·9878	0·9901
57	43	0·9016	0·9145	6	94	0·9897	0·9915
56	44	0·9038	0·9168	5	95	0·9914	0·9929
55	45	0·9060	0·9191	4	96	0·9931	0·9943
54	46	0·9082	0·9214	3	97	0·9948	0·9957
53	47	0·9104	0·9237	2	98	0·9965	0·9971
52	48	0·9127	0·9259	1	99	0·9982	0·9985
51	49	0·915	0·9281	0	100	1·0000	1·0000
50	50	0·9173	0·9303	—	—	—	—

NITRIC ACID.

Quantities of Liquid and of Anhydrous Acid contained in Mixtures of Nitric Acid and Water at different Densities (Ure—60° Fahr.).

Specific gravity.	Liquid acid, s.g. 1·5, in 100.	Anhydrous acid in 100.	Specific gravity.	Liquid acid, s.g. 1·5, in 100.	Anhydrous acid in 100.	Specific gravity.	Liquid acid, s.g. 1·5, in 100.	Anhydrous acid in 100.
1·5	100	79·7	1·378	66	52·602	1·189	33	26·301
1·498	99	78·903	1·373	65	51·805	1·183	32	25·504
1·496	98	78·106	1·368	64	51·068	1·177	31	24·707
1·494	97	77·309	1·363	63	50·211	1·171	30	23·9
1·491	96	76·512	1·358	62	49·414	1·165	29	23·113
1·488	95	75·715	1·353	61	48·617	1·159	28	22·316
1·485	94	74·918	1·348	60	47·82	1·153	27	21·579
1·482	93	74·121	1·343	59	47·023	1·146	26	20·722
1·479	92	73·324	1·338	58	46·226	1·14	25	19·925
1·476	91	72·527	1·332	57	45·429	1·134	24	19·128
1·473	90	71·73	1·327	56	44·632	1·129	23	18·331
1·47	89	70·933	1·322	55	43·835	1·123	22	17·534
1·467	88	70·136	1·316	54	43·038	1·117	21	16·737
1·464	87	69·339	1·311	53	42·241	1·111	20	15·94
1·46	86	68·542	1·306	52	41·444	1·105	19	15·143
1·457	85	67·745	1·3	51	40·647	1·099	18	14·346
1·453	84	66·948	1·295	50	39·85	1·093	17	13·549
1·45	83	66·155	1·289	49	39·053	1·088	16	12·752
1·446	82	65·354	1·283	48	38·256	1·082	15	11·955
1·442	81	64·557	1·276	47	37·459	1·076	14	11·158
1·438	80	63·760	1·27	46	36·662	1·071	13	10·361
1·435	79	62·963	1·264	45	35·865	1·065	12	9·564
1·431	78	62·166	1·258	44	35·068	1·059	11	8·767
1·427	77	61·639	1·252	43	34·271	1·054	10	7·97
1·423	76	60·572	1·246	42	33·474	1·048	9	7·173
1·419	75	59·775	1·24	41	32·677	1·043	8	6·376
1·415	74	58·978	1·234	40	31·88	1·037	7	5·579
1·411	73	58·181	1·228	39	31·083	1·032	6	4·782
1·406	72	57·384	1·221	38	30·286	1·027	5	3·985
1·402	71	56·587	1·215	37	29·489	1 021	4	3·188
1·398	70	55·79	1·208	36	28·692	1·016	3	2·391
1·395	69	54·993	1·202	35	27·895	1·011	2	1·594
1·388	68	54·196	1·196	34	27·098	1·005	1	0·797
1·383	67	53·399						

SULPHURIC ACID.

QUANTITIES of Liquid and Anhydrous Acid in Mixtures of Sulphuric Acid and Water at different Densities.

Specific gravity.	Liquid acid, s.g. 1·8485, in 100.	Anhydrous acid in 100.	Specific gravity.	Liquid acid, s.g. 1·8485, in 100.	Anhydrous acid in 100.	Specific gravity.	Liquid acid, s.g. 1·8485, in 100.	Anhydrous acid in 100.
1·8485	100	81·54	1·5503	66	53·82	1·2409	33	26·91
1·8475	99	80·72	1·5390	65	53·30	1·2334	32	26·09
1·846	98	79·9	1·5280	64	52·18	1·2260	31	25·28
1·8439	97	79·09	1·5170	63	51·37	1·2184	30	24·46
1·841	96	78·28	1·5066	62	50·55	1·2108	29	23·65
1·8376	95	77·46	1·4960	61	49·74	1·2032	28	22·83
1·8336	94	76·65	1·4860	60	48·92	1·1956	27	22·01
1·829	93	75·83	1·4760	59	48·11	1·1876	26	21·20
1·8233	92	75·02	1·4660	58	47·29	1·1792	25	20·38
1·8179	91	74·20	1·4560	57	46·48	1·1706	24	19·57
1·8115	90	73·39	1·4460	56	45·66	1·1626	23	18·75
1·8043	89	72·57	1·4360	55	44·85	1·1549	22	17·94
1·7962	88	71·75	1·4265	54	44·03	1·1480	21	17·12
1·7870	87	70·94	1·4170	53	43·22	1·1410	20	16·31
1·7774	86	70·12	1·4073	52	42·40	1·1330	19	15·49
1·7673	85	69·31	1·3977	51	41·58	1·1246	18	14·68
1·7570	84	68·49	1·3884	50	40·77	1·1165	17	13·86
1·7465	83	67·68	1·3788	49	39·95	1·1090	16	13·05
1·7360	82	66·86	1·3697	48	39·14	1·1019	15	12·23
1·7245	81	66·05	1·3612	47	38·32	1·0953	14	11·41
1·7100	80	65·23	1·3530	46	37·51	1·0887	13	10·60
1·6993	79	64·42	1·3440	45	36·69	1·0809	12	9·78
1·6870	78	63·6	1·3345	44	35·88	1·0743	11	8·97
1·6750	77	62·78	1·3255	43	35·06	1·0682	10	8·15
1·6630	76	61·97	1·3165	42	34·25	1·0614	9	7·34
1·6520	75	61·15	1·3080	41	33·43	1·0544	8	6·52
1·6415	74	60·34	1·2999	40	32·61	1·0477	7	5·71
1·6321	73	59·52	1·2913	39	31·80	1·0405	6	4·89
1·6204	72	58·71	1·2826	38	30·98	1·0336	5	4·08
1·6090	71	57·89	1·2740	37	30·17	1·0268	4	3·26
1·5975	70	57·08	1·2654	36	29·35	1·0206	3	2·45
1·5868	69	56·26	1·2572	35	28·54	1·0140	2	1·63
1·5760	68	55·45	1·2490	34	27·72	1·0074	1	0·82
1·5648	67	54·63						

HYDROCHLORIC ACID.

Quantities of Liquid and of Anhydrous Acid and of Chlorine in Mixtures of Hydrochloric Acid and Water at different Densities.

Specific Gravity.	Liquid Acid, s.g. 1·20, in 100.	H. Cl. in 100.	Cl. in 100.	Specific Gravity.	Liquid Acid, s.g. 1·20, in 100.	H. Cl. in 100.	Cl. in 100.
1·2000	100	40·777	39·675	1·1000	50	20·388	19·837
1·1982	99	40·369	39·278	1·0980	49	19·980	19·440
1·1964	98	39·961	38·882	1·0960	48	19·572	19·044
1·1946	97	39·554	38·485	1·0939	47	19·165	18·647
1·1928	96	39·146	38·089	1·0919	46	18·757	18·250
1·1910	95	38·738	37·692	1·0899	45	18·349	17·854
1·1893	94	38·330	37·296	1·0879	44	17·941	17·457
1·1875	93	37·923	36·900	1·0859	43	17·534	17·060
1·1857	92	37·516	36·503	1·0838	42	17·126	16·664
1·1846	91	37·108	36·107	1·0818	41	16·718	16·217
1·1822	90	36·700	35·707	1·0798	40	16·310	15·870
1·1802	89	36·292	35·310	1·0778	39	15·902	15·474
1·1782	88	35·884	34·913	1·0758	38	15·494	15·077
1·1762	87	35·476	34·517	1·0738	37	15·087	14·680
1·1741	86	35·068	34·121	1·0718	36	14·679	14·284
1·1721	85	34·660	33·724	1·0697	35	14·212	13·887
1·1701	84	34·252	33·328	1·0677	34	13·863	13·490
1·1681	83	33·845	32·931	1·0657	33	13·456	13·094
1·1661	82	33·437	32·535	1·0637	32	13·049	12·697
1·1641	81	33·027	32·136	1·0617	31	12·641	12·300
1·1620	80	32·621	31·746	1·0597	30	12·230	11·903
1·1599	79	32·213	31·343	1·0577	29	11·825	11·506
1·1578	78	31·805	30·946	1·0557	28	11·418	11·109
1·1557	77	31·398	30·550	1·0537	27	11·010	10·712
1·1537	76	30·990	30·153	1·0517	26	10·602	10·316
1·1515	75	30·582	29·757	1·0497	25	10·194	9·919
1·1494	74	30·174	29·361	1·0477	24	9·786	9·522
1·1473	73	29·767	28·964	1·0457	23	9·379	9·136
1·1452	72	29·359	28·567	1·0437	22	8·971	8·729
1·1431	71	28·951	28·171	1·0417	21	8·563	8·332
1·1410	70	28·544	27·772	1·0397	20	8·155	7·935
1·1389	69	28·136	27·736	1·0377	19	7·747	7·538
1·1369	68	27·728	26·979	1·0357	18	7·340	7·141
1·1349	67	27·321	26·583	1·0337	17	6·932	6·745
1·1328	66	26·913	26·186	1·0318	16	6·524	6·348
1·1308	65	26·505	25·789	1·0298	15	6·116	5·951
1·1287	64	26·098	25·392	1·0279	14	5·709	5·554
1·1267	63	25·690	24·996	1·0259	13	5·301	5·158
1·1247	62	25·282	24·599	1·0239	12	4·893	4·762
1·1226	61	24·874	24·202	1·0220	11	4·486	4·362
1·1206	60	24·466	23·805	1·0200	10	4·078	3·968
1·1185	59	24·058	23·408	1·0180	9	3·670	3·571
1·1164	58	23·650	23·012	1·0160	8	3·262	3·174
1·1143	57	23·242	22·615	1·0140	7	2·854	2·778
1·1123	56	22·834	22·218	1·0120	6	2·447	2·381
1·1102	55	22·426	21·822	1·0100	5	2·039	1·984
1·1082	54	22·019	21·425	1·0080	4	1·631	1·588
1·1061	53	21·611	21·028	1·0060	3	1·224	1·191
1·1041	52	21·203	20·632	1·0040	2	0·816	0·795
1·1020	51	20·796	20·236	1·0020	1	0·408	0·397

ACETIC ACID.

Quantities of Crystallisable Acid in Mixtures of Acetic Acid and Water of various Densities at 15° C.

Parts of Crystallisable Acid in 100.	Specific Gravity.	Parts of Crystallisable Acid in 100.	Specific Gravity.	Parts in Crystallisable Acid in 100.	Specific Gravity.	Parts of Crystallisable Acid in 100.	Specific Gravity.
100	1·0553	75	1·0746	50	1·0615	25	1·0350
99	1·0580	74	1·0744	49	1·0607	24	1·0337
98	1·0604	73	1·0742	48	1·0598	23	1·0324
97	1·0625	72	1·0740	47	1·0589	22	1·0311
96	1·0644	71	1·0737	46	1·0580	21	1·0298
95	1·0660	70	1·0733	45	1·0571	20	1·0284
94	1·0674	69	1·0729	44	1·0562	19	1·0270
93	1·0686	68	1·0725	43	1·0552	18	1·0256
92	1·0696	67	1·0721	42	1·0543	17	1·0242
91	1·0705	66	1·0717	41	1·0533	16	1·0228
90	1·0713	65	1·0712	40	1·0523	15	1·0214
89	1·0720	64	1·0707	39	1·0513	14	1·0201
88	1·0726	63	1·0702	38	1·0502	13	1·0185
87	1·0731	62	1·0697	37	1·0492	12	1·0171
86	1·0736	61	1·0691	36	1·0481	11	1·0157
85	1·0739	60	1·0685	35	1·0470	10	1·0142
84	1·0742	59	1·0679	34	1·0459	9	1·0127
83	1·0744	58	1·0673	33	1·0447	8	1·0113
82	1·0746	57	1·0666	32	1·0436	7	1·0098
81	1·0747	56	1·0660	31	1·0424	6	1·0083
80	1·0748	55	1·0653	30	1·0412	5	1·0067
79	1·0748	54	1·0646	29	1·0400	4	1·0052
78	1·0748	53	1·0638	28	1·0388	3	1·0037
77	1·0748	52	1·0631	27	1·0375	2	1·0022
76	1·0747	51	1·0623	26	1·0363	1	1·0007

N.B.—The density of the mixture increases until nearly 25°/$_0$ of water is present, after which it again decreases. Acetic acid is therefore better tested volumetrically with a standard solution of alkali.

SULPHUROUS ACID.

Quantities of Anhydrous Sulphurous Acid in Solutions of different Densities.

F. Authon.

Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Andydrous Acid in 100.
1·046	9·54	1·027	6·68	1·020	4·77	1·013	2·86
1·036	8·59	1·023	5·72	1·016	3·82	1·009	1·90
1·031	7·63	—	—	—	—	1·005	0·95

FRENCH FLUID MEASURES.

THE cubic centimètre, usually represented by 'c. c.,' is the unit of the French measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gramme. Hence it will be seen that the cubic centimètre and the gramme bear to each other the same relation as our drachm for solids and the drachm for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:—

1 cubic centimètre	=	17	minims (as near as possible).			
2 cubic centimètres	=	34	,,			
3 ,,	=	51	,,			
4 ,,	=	68	,,	or 1 drachm	8 minims.	
5 ,,	=	85	,,	,, 1 ,,	25 ,,	
6 ,,	=	102	,,	,, 1 ,,	42 ,,	
7 ,,	=	119	,,	,, 1 ,,	59 ,,	
8 ,,	=	136	,,	,, 2 drachms	16 ,,	
9 ,,	=	153	,,	,, 2 ,,	33 ,,	
10 ,,	=	170	,,	,, 2 ,,	50 ,,	
20 ,,	=	340	,,	,, 5 ,,	40 ,,	
30 ,,	=	510	,,	,, 1 ounce	0 drachm	30 minims.
40 ,,	=	680	,,	,, 1 ,,	3 drachms	20 ,,
50 ,,	=	850	,,	,, 1 ,,	6 ,,	10 ,,
60 ,,	=	1020	,,	,, 2 ounces	1 ,,	0 ,,
70 ,,	=	1190	,,	,, 2 ,,	3 ,,	50 ,,
80 ,,	=	1360	,,	,, 2 ,,	6 ,,	40 ,,
90 ,,	=	1530	,,	,, 3 ,,	1 ,,	30 ,,
100 ,,	=	1700	,,	,, 3 ,,	4 ,,	20 ,,

THE CONVERSION OF FRENCH INTO ENGLISH WEIGHT.

ALTHOUGH a gramme is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be 15⅖ grains, which is the nearest approach that can be made to *practical* accuracy:

1 gramme	=	15⅖	grains.			
2 grammes	=	30⅘	,,			
3 ,,	=	46⅕	,,			
4 ,,	=	61⅗	,,	……… or	1 drachm	1⅗ grain.
5 ,,	=	77	,,	……… ,,	1 ,,	17 grains.
6 ,,	=	92⅖	,,	……… ,,	1 ,,	32⅖ ,,
7 ,,	=	107⅘	,,	……… ,,	1 ,,	47⅘ ,,
8 ,,	=	123⅕	,,	……… ,,	2 drachms	3⅕ ,,
9 ,,	=	138⅗	,,	……… ,,	2 ,,	18⅗ ,,
10 ,,	=	154	,,	……… ,,	2 ,,	34 ,,
11 ,,	=	169⅖	,,	……… ,,	2 ,,	49⅖ ,,
12 ,,	=	184⅘	,,	……… ,,	3 ,,	4⅘ ,,
13 ,,	=	200⅕	,,	……… ,,	3 ,,	20⅕ ,,
14 ,,	=	215⅗	,,	……… ,,	3 ,,	35⅗ ,,
15 ,,	=	231	,,	……… ,,	3 ,,	51 ,,
16 ,,	=	246⅖	,,	……… ,,	4 ,,	6⅖ ,,
17 ,,	=	261⅘	,,	……… ,,	4 ,,	21⅘ ,,
18 ,,	=	277⅕	,,	……… ,,	4 ,,	37⅕ ,,
19 ,,	=	292⅗	,,	……… ,,	4 ,,	52⅗ ,,
20 ,,	=	308	,,	……… ,,	5 ,,	8 ,,
30 ,,	=	462	,,	……… ,,	7 ,,	42 ,,
40 ,,	=	616	,,	……… ,,	10 ,,	16 ,,
50 ,,	=	770	,,	……… ,,	12 ,,	50 ,,
60 ,,	=	924	,,	……… ,,	15 ,,	24 ,,
70 ,,	=	1078	,,	……… ,,	17 ,,	58 ,,
80 ,,	=	1232	,,	……… ,,	20 ,,	32 ,,
90 ,,	=	1386	,,	……… ,,	23 ,,	6 ,,
100 ,,	=	1540	,,	……… ,,	25 ,,	40 ,,

THERMOMETRIC TABLES,
SHOWING THE ASSIMILATION OF THE THERMOMETERS IN USE THROUGHOUT THE WORLD.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·0	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·8	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176·0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·8
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	36·5
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

WITH a view of simplifying the calculations involved in emulsion making, Mr. William Ackland has worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ease and rapidity the proper quantities of silver or haloid salts in any formula. Even those who are able to perform the calculations in the recognised style will find their labours materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide	98	1·734	·576	1·918	·521	1·106
Potassium ,, ...	119·1	1·427	·700	1·578	·633	
Sodium ,, ...	103	1·650	·606	1·825	·548	
Cadmium ,, com.	172	·988	1·012	1·093	·915	
,, ,, anh.	136	1·25	·800	1·382	·723	
Zinc ,, ...	112·1	1·509	·663	1·670	·600	
Ammonium chloride	53·5	3·177	·315	2·682	·373	·844
Sodium ,, ...	58·5	2·906	·344	2·453	·408	
Ammonium iodide	145	1·172	·853	1·620	·617	1·332
Potassium ,, ...	166·1	1·023	·977	1 415	·707	
Sodium ,, ...	150	1·133	·882	1·566	·633	
Cadmium ,, ...	183	·929	1·076	1·284	·778	

The principal bromides, chlorides, and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. I. presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :—

Bromide of potassium	150 grains.
Iodide of potassium	10 ,,
Chloride of ammonium	10 ,,
Gelatine	200 ,,

Now we want to know how much silver nitrate should be employed in sensitising this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :—

Potassium bromide .... 150 × 1·427 = 214
, iodide .... 10 × 1·023 = 10·23
Chloride of ammonium ... 10 × 3·177 = 31·77
} Weight silver nitrate required,

or the total quantity of silver nitrate required for full conversion, 256·00 grains,

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide. (Coml.)	Cadmium Bromide (Anhyd.)	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide...........	**1**	·823	·951	·57	·72	·87	1·832	1·675	·676	·59	·653	·535
Potassium ,, ...	1·215	**1**	1·156	·692	·876	1·058	2·226	2·036	·821	·717	·794	·651
Sodium ,, ...	1·051	·865	**1**	·599	·757	·915	1·925	1·761	·71	·62	·686	·563
Cadmium ,, com.	1·755	1·444	1·67	**1**	1·265	1·527	3·215	2·94	1·186	1·035	1·146	·94
,, ,, anh.	1·387	1·141	1·32	·79	**1**	1·207	2·542	2·324	·938	·819	·906	·743
Zinc ,, ...	1·149	·945	1·093	·655	·828	**1**	2·104	1·925	·776	·678	·75	·615
Ammonium chloride...........	·546	·449	·519	·311	·393	·475	**1**	·914	·369	·322	·356	·292
Sodium ,, ...	·597	·491	·568	·34	·43	·519	1·093	**1**	·403	·352	·39	·319
Ammonium iodide..............	1·479	1·217	1·408	·843	1·066	1·287	2·712	2·478	**1**	·873	·966	·792
Potassium ,, ...	1·695	1·394	1·612	·965	1·221	1·475	3·104	2·839	1·145	**1**	1·107	·907
Sodium ,, ...	1·53	1·259	1·456	·872	1·103	1·332	2·803	2·564	1·034	·903	**1**	·819
Cadmium ,, ...	1·867	1·536	1·776	1·064	1·345	1·625	3·42	3·128	1·262	1·102	1·22	**1**

TABLE NO. II. gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed 'Ammonium Bromide,' we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1·215; that is to say, 1·215 grain of potassium bromide will be required to do the same work as one of NH_4 Br.

MR. W. K. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

Apertures Calculated on the Standard System of the Photographic Society.	Sea and Sky.	Open Land-scape.	Landscape with heavy foliage in foreground.	Under Trees, up to		Fairly-lighted Interiors.		Badly-lighted Interiors, up to		Portraits in bright diffused Light out of doors.	Portraits in good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hours.	mins.		mins.	secs.	mins.	secs.
No. 1, or $\frac{f}{4}$	$\frac{1}{160}$ sec.	$\frac{1}{50}$ sec.	$\frac{1}{8}$ sec.	0	10	0	10	0	2	$\frac{1}{6}$ sec.	0	1	0	4
No. 2, or $\frac{f}{5 \cdot 657}$	$\frac{1}{80}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{4}$ sec.	0	20	0	20	0	4	$\frac{1}{3}$ sec.	0	2	0	8
No. 4, or $\frac{f}{8}$	$\frac{1}{40}$ sec.	$\frac{1}{12}$ sec.	$\frac{1}{2}$ sec.	0	40	0	40	0	8	$\frac{2}{3}$ sec.	0	4	0	16
No. 8, or $\frac{f}{11 \cdot 314}$	$\frac{1}{20}$ sec.	$\frac{1}{6}$ sec.	1 sec.	1	20	1	20	0	16	$1\frac{1}{3}$ sec.	0	8	0	32
No. 16, or $\frac{f}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	2 secs.	2	40	2	40	0	32	$2\frac{2}{3}$ secs.	0	16	1	4
No. 32, or $\frac{f}{22 \cdot 627}$	$\frac{1}{5}$ sec.	$\frac{2}{3}$ sec.	4 secs.	5	20	5	20	1	4	$5\frac{1}{3}$ secs.	0	32	2	8
No. 64, or $\frac{f}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	8 secs.	10	40	10	40	2	8	$10\frac{1}{2}$ secs.	1	4	4	15
No. 128, or $\frac{f}{45 \cdot 255}$	$\frac{4}{5}$ sec.	$2\frac{2}{3}$ secs.	16 secs.	21	0	21	0	4	15	21 secs.	2	8	8	30
No. 256, or $\frac{f}{64}$	$1\frac{1}{2}$ sec.	$5\frac{1}{2}$ secs.	32 secs.	42	0	42	0	8	30	42 secs.	4	15	17	0

DR. SCOTT'S TABLES OF COMPARATIVE EXPOSURES.

THE following Table, compiled by Dr. J. A. Scott, shows the comparative value of daylight at different hours of the day and seasons of the year, and is intended for use in conjunction with that of Mr. W. K. Burton.

Table of Comparative Exposures.

Hour of Day.		June	May July	April Aug.	Mar. Sept.	Feb. Oct.	Jan. Nov.	Dec.
A.M.	P.M.							
12		1	1	1¼	1½	2	3½	4
11	1	1	1	1¼	1½	2½	4	5
10	2	1	1	1¼	1¾	3	5	6
9	3	1	1¼	1½	2	4	*12	*16
8	4	1½	1½	2	3	*10	—	—
7	5	2	2½	3	*6	—	—	—
6	6	2½	*3	*6	—	—	—	—
5	7	*5	*6	—	—	—	—	—
4	8	*12	—	—	—	—	—	—

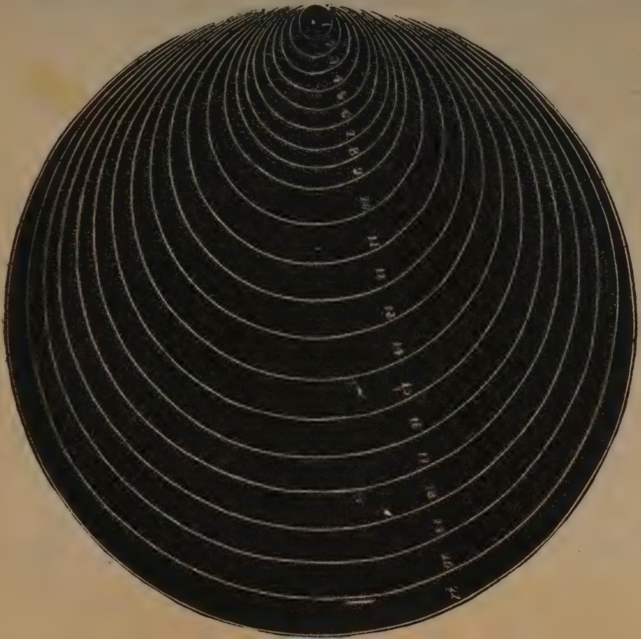
* The accuracy of these figures would be affected by a yellow sunset.

Mr. Burton's Table of Comparative Exposures (slightly altered).

	Sea and Sky.	Open Landscape.	Landscape and Foreground. Buildings.	Heavy Foliage. Foreground. Portrait out of Doors.	Portrait in Studio Light.	Portrait in ordinary Room.	Under Trees. Fairly Lighted Interiors.	Badly Lighted Interiors.
$\frac{f}{16}$	⅒ sec.	⅓ sec.	1 sec.	2 sec.	16 sec.	1 min.	2½ min.	½ hour
$\frac{f}{32}$	⅖ sec.	1⅓ sec.	4 sec.	8 sec.	1 min.	4 min.	10 min.	2 hours
$\frac{f}{64}$	1½ sec.	5 sec.	16 sec.	32 sec.	4 min.	16 min.	40 min.	8 hours

THE PHOTOGRAPHIC SOCIETY'S STANDARD DIAPHRAGMS.

THE annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Photographic Society of Great Britain's Uniform system, which will be found described on another page. This number it is proposed to call the 'U. S.' (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: a lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5 we find in the column under—'focus eight inches' the number 11, which is the U. S. number required.



No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	$6\frac{1}{4}$	10	14	19	25	31	40	56	
4	4	$6\frac{1}{4}$	9	12	16	20	25	36	48
5	$2\frac{3}{4}$	$4\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{2}$	11	14	17	25	34
6	2	$3\frac{1}{5}$	$4\frac{1}{2}$	$6\frac{1}{4}$	8	10	13	18	25
7	$1\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{3}{4}$	6	8	10	14	19
8	$1\frac{1}{4}$	2	$2\frac{3}{4}$	$3\frac{3}{4}$	5	$6\frac{1}{4}$	8	11	15
9	1	$1\frac{1}{2}$	$2\frac{1}{4}$	3	4	5	$6\frac{1}{4}$	9	$12\frac{1}{4}$
10		1	$1\frac{1}{2}$	$2\frac{1}{8}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$4\frac{1}{3}$	6	$8\frac{1}{2}$
11			$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{5}$	5	6
12			$\frac{7}{8}$	$1\frac{1}{5}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{3}{4}$
13				1	$1\frac{1}{4}$	$1\frac{5}{6}$	$1\frac{2}{3}$	$2\frac{3}{4}$	4
14					1	$1\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{4}$	3
15						1	$1\frac{1}{3}$	$1\frac{7}{8}$	$2\frac{1}{2}$
16							1	$1\frac{1}{2}$	2
17								$1\frac{1}{3}$	$7\frac{2}{3}$
18								$1\frac{1}{6}$	$1\frac{1}{2}$
19								1	$1\frac{1}{3}$
20									$1\frac{1}{5}$
21									1

'UNIFORM SYSTEM' NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the 'uniform system' of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.
1	$\frac{1}{16}$
1¼	·097
1·414	⅛
1½	·140
1¾	·191
2	¼
2¼	·316
2½	·390
2·828	½
2¾	·472
3	·562
3¼	·660
3½	·765
3¾	·878
4	1·00
4¼	1·12
4½	1·26
4¾	1·41
5	1·56
5¼	1·72
5½	1·89
5·656	2
5¾	2·06
6	2·25
6¼	2·44
6½	2·64
6¾	2·84
7	3·06
7¼	3·28
7½	3·51
7¾	3·75
8	4
8¼	4·25
8½	4·51
8¾	4·78
9	5·06
9¼	5·34
9½	5·64
9¾	5·94
10	6·25
11	7·56
11·31	8
12	9·00
13	10·56
14	12·25
15	14·06
16	16
17	18·06
18	20·25
19	22·56
20	25·00
21	27·56
22	30·25
22·62	32
23	33·06
24	36·00
25	39·06
26	42·25
27	45·56
28	49·00
29	52·56
30	56·25
31	60·06
32	64
33	68·06
34	72·25
35	76·56
36	81·00
37	85·56
38	90·25
39	95·06
40	100·00
41	105·06
42	110·25
43	115·56
44	121·00
45	126·56
45·25	128
46	132·25
47	138·06
48	144·00
49	150·06
50	156·25
51	162·56
52	169·00
53	175·56
54	182·25
55	189·06
56	196·00
57	203·06
58	210·25
59	217·56
60	225·00
61	232·56
62	240 25
63	248·06
64	256
65	264·06
66	272·25
67	280·56
68	289·00
69	297·56
70	306·25
71	315·06
72	324·00
73	333·06
74	342·25
75	351·56
76	361·00
77	370·56
78	380·25
79	390·06
80	400·00
81	410·06
82	420·25
83	430·56
84	440·00
85	451·56
86	462·25
87	473·06
88	484·00
89	495·06
90	506·25
90·50	512
91	517·56
92	529·00
93	540·56
94	552·25
95	564·06
96	576·00
97	588·06
98	600·25
99	612·56
100	625·00

TABLE FOR ENLARGEMENTS.

Focus of Lens, inches.	TIMES OF ENLARGEMENT AND REDUCTION.							
	1 inches.	**2** inches.	**3** inches.	**4** inches.	**5** inches.	**6** inches.	**7** inches.	**8** inches.
2	4 4	6 3	8 $2\frac{3}{4}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{11}{12}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{13}{16}$
3	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{4}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{15}{16}$
4	8 8	12 6	16 $5\frac{1}{4}$	20 5	24 $4\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $7\frac{1}{8}$	$27\frac{1}{2}$ $6\frac{7}{8}$	33 $6\frac{1}{2}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{6}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

THE object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration:—A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must, therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—$7\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied; the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for six in this column and multiply by 2; and so on with any other numbers.

EQUATIONS RELATING TO FOCI, &c.

The following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:—

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versâ* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = 'Uniform System' No. of do.
x = Comparative exposure required.

Then

$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$

$$F = p\,(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$

$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$

$$D = p \times \frac{(r+1)^2}{r} = f\,(r+1) = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$

$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N.B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

Note.—In case the above may not be clear to some photographers, the following rules may be better understood:—

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D); next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r+1$ and divide the product by r. Or divide D by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F - p$ (the difference between F and p) by p. Or divide p by $f - p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example: focus an object which is five inches high, so that it is one inch high on the ground-glass; thus we know that $r = 5$. Next measure the distance between the object and the ground-glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains = 1 Scruple = 20 Grains.
3 Scruples = 1 Drachm = 60 „
8 Drachms = 1 Ounce = 480 „
12 Ounces = 1 Pound = 5760 „

FLUID.

Symbol.
60 Minims = 1 Fluid Drachm f. ʒ
8 Drachms = 1 Ounce f.
20 Ounces = 1 Pint O ℥
8 Pints = 1 Gallon gall.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT.

27⅓ ½ Grains = 1 Drachm = 27⅓ ½ Grains.
16 Drams = 1 Ounce = 437½ „
16 Ounces = 1 Pound = 7000 „

Precious Metals are usually sold by

TROY WEIGHT.

24 Grains = 1 Pennyweight = 24 Grains.
20 Pennyweights = 1 Ounce = 480 „
12 Ounces = 1 Pound = 5760 „

NOTE.—An ounce of *metallic* silver contains 480 grains, but an ounce of *nitrate* of silver contains only 437½ grains.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre = 17 minims nearly.
3½ „ „ = 1 drachm.
28·4 „ „ = 1 ounce.
50 „ „ = 1 ounce 6 drachms 5 minims.
100 „ „ = 3 ounces 4 drachms 9 minims.
1000 „ „ or 1 litre, = to 61 cubic inches } = 35 ounces 1 drachm 36 minims.

The unit of French liquid measures is a cubic *centimètre.*

A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme.* A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = to 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes. Drachms. Oz. Drachm. Grains.
100 ÷ 4 = 25 = 3 . 1 + 43

FOREIGN PHOTOGRAPHIC JOURNALS.

Anthony's Photographic Bulletin.—Published by E. & H. T. Anthony, 591 Broadway, New York.

Photographic Times.—Published by the Scovill Manufacturing Company, 419 Broome Street, New York.

Philadelphia Photographer.—Published by E. L. Wilson, New York.

The St. Louis Photographer.—Published by Mrs. J. H. Fitzgibbon, St. Louis.

The Photographic Eye.—Edited by C. Gentilé, Chicago.

The Photographic Beacon.—Edited by J. Nicol, Chicago.

The American Journal of Photography.—Published by Thos. McCollin, Philadelphia.

Bulletin de la Société Française de Photographie.—The organ of the French Photographic Society. Published by M. Gauthier-Villars, Paris.

Le Moniteur de la Photographie.—Edited by M. Léon Vidal.

Revue Photographique.—Official organ of the Société Française des Archives Photographiques, Historiques et Monumentales. Edited by E. Letellier.

Journal de l'Industrie Photographique.—Organ of la Chambre Syndicale de la Photographie. Published by M. Gauthier-Villars, Paris.

Bulletin de la Société Photographique de Tolouse.—Organ of the Société de Tolouse.

Bulletin de l'Association Belge de Photographie.—The organ of the Belgian Photographic Association. Edited and managed by the officers of the Association.

Bulletin Belge de la Photographie.—Edited by M. Leon Deltenre. Published by M. J. Petit, Brussels.

Photographische Mittheilungen.—Edited by Dr. Hermann W. Vogel. Published by Robert Oppenhein, Berlin. Organ of the Berlin Association for the Cultivation of Photography.

Photographisches Wochenblatt.—Edited by Dr. Franz Stolze, Düsseldorf. Published at Berlin. Organ of the Berlin Photographic Society.

Photographisches Archiv.—Edited by Dr. Paul E. Liesegang, Düsseldorf. Published by Ed. Liesegang's Verlag, Düsseldorf.

Photographische Correspondenz.—Edited by Dr. Emil Hornig. Published at Vienna. The organ of the Vienna Photographic Society.

Photographische Notizen.—Edited by C. Schierer. Published by A. Moll, Vienna.

Deutsche Photographen-Zeitung.—Edited and published by K. Schwier, Weimar. Organ of the Association of German Photographers.

Photographische Monatsblätter.—Edited and published by Dr. C. Schleussner, Frankfort-on-Maine. Organ of the Frankfort and Cologne Photographic Societies.

Tydschrift voor Photographie.—Published by A. W. Groote, Amsterdam. Organ of the Amsterdam Photographic Association.

Beretninger fur Dansk Fotografisk Forening.—Organ of the Photographic Society of Copenhagen.

Fotografiske Meddelelser.—Published by Mansfeld-Büllner and Lassen, Copenhagen; also Immanuel Rée.

Photographischer Beobachter.—Edited by Julius Pfeiffer. Published by Carl Groll, Guben.

Zeitschrift für Practische Photographie und Verwandte Fächer.—Edited by J. A. Finsterlin. Published at Munich. Organ of the Photographic Society of Munich.

Rivista Fotographica Universale.—Edited by Signor Montagna. Published irregularly, Brindisi.

Der Photograph.—Published at St. Petersburg. Organ of the fifth section of the Imperial Russian Technical Society. Edited by W W. Sreznewsky.

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No. 1994.—'Improvements in the Method of Stretching Artists' Canvases and the like, and in Apparatus and Appliances therefor.' Communicated by William Cutts. A. J. BOULT.—*Dated February* 11, 1886.

No. 2026.—'An Improved Portable Photographic Camera.' FREDERICK DRESSER.—*Dated February* 12, 1886.

No. 2039.—'Improvements in Photographic Cameras and Stands.' HARRY LUCAS.—*Dated February* 12, 1886.

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No. 2365.—'Improvements in Photographic Cameras.' C. D. DURNFORD.—*Dated February* 18, 1886.

No. 2370.—'Improvements in or appertaining to Photographic Apparatus in which a Roll of Sensitised Flexible Fabric, Paper, or Band, is used.' W. ROGERS.—*Dated February* 18, 1886.

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No. 2390.—'Improvements in Holders or Carriers for Flexible Material Sensitive to Light for the Purpose of taking Photographic Pictures.' F. J. VERGARA.—*Dated February* 18, 1886.

No. 2423.—'Improvements in Stands or Supports for Photographic Cameras.' A. RAYMENT.—*Dated February* 19, 1886.

No. 2459.—'Improvements in or appertaining to Magic Lanterns and Lamps to be used therewith.' A. WRENCH.—*Dated February* 19, 1886.

No. 2495.—'Improvements in Tripods for Photographic Purposes, applicable also to other similar uses.' C. A. ESKELL.—*Dated February* 20, 1886.

No. 2533.—'Improvements in the Manufacture of Magic Lantern and other Slides.' D. SHERLOCK and O. BOEDDICKER.—*Dated February* 22, 1886.

No. 2670.—'Improvements in the Formation and Construction of Photographic Cameras.' J. E. THORNTON.—*Dated February* 24, 1886.

No. 2811.—'Improvements in the Focussing Arrangements of Cameras.' W. F. STANLEY.—*Dated February* 26, 1886.

No. 2876.—'Improvements in Portable Photographic Cameras.' W. H. PAYNE-GALLWEY.—*Dated February* 27, 1886.

No. 2893.—'Improvements in Instantaneous Photographic Camera Shutters.' W. J. LANCASTER.—*Dated March* 1, 1886.

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No. 3189.—'Improvements in Machines for Applying Photographic Emulsion to Photographic Plates.' E. J. PALMER.—*Dated March* 6, 1886.

No. 3269.—'Stretching or Straining Paper for Use for Photographic Purposes, &c." W. T. MORGAN and R. L. KIDD.—*Dated March* 9, 1886.

No. 3324.—'Improvements in Photographic Cameras.' C. SANDS and J. J. HUNTER.—*Dated March* 9, 1886.

No. 3325.—'An Improved Indicator and Lock for the Shutters of Photographic Dark Backs or Slides.' F. HAZELDINE.—*Dated March* 9, 1886.

No. 3394.—'Improvements in Photographic Apparatus.' Communicated by C. V. Labargé. G. F. REDFERN.—*Dated March* 10, 1886.

No. 3411.—'Improvements in the Formation and Construction of Stands or Supports for Cameras.' J. E. THORNTON.—*Dated March* 11, 1886.

No. 3805.—'Improvements in Optical Lanterns." H. M. WHITEFIELD and S. WASHINGTON.—*Dated March* 18, 1886.

No. 3858.—'Improvements in the Valves known as "Back-Pressure Valves," and in certain other Valves.' T. H. WHITE.—*Dated March* 18, 1886.

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No. 4179.—'The New Cartro Repeating Photo Dark Slides—a Slide within a Slide.' J. D. WILLIAMS.—*Dated March* 25, 1886.

No. 4543.—'An Improved Magic Lantern.' J. W. REFFITT.—*Dated April* 1, 1886.

No. 4615.—'Making Exposures in Photographic Cameras.' C. CUSWORTH.—*Dated April* 2, 1886.

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No. 4920.—'An Improved Show Case for Exhibiting Photographs and like Pictures in Succession.' W. McCall and A. Smith.—*Dated April* 8, 1886.

No. 4965.—'Improvements in Machines or Apparatus for Applying Photographic Emulsion, and for similar Purposes.' E. J. Palmer.—*Dated April* 9, 1886.

No. 5028.—'Improvements in Stands for Photographic Cameras, Easels, and the like.' G. L. Johnson.—*Dated April* 10, 1886.

No. 5075.—'Washing Photographic Prints.' E. J. Pound.—*Dated April* 12, 1886.

No. 5120.—'A Device to give Help in Drawing Objects as they Appear, by Showing the Apparent Direction to the Eye of Lines which are or are not Parallel to the Picture Plane.' Complete specification. T. R. Ablett.—*Dated April* 13, 1886.

No. 5181.—'A Photographic Dark Slide of an Improved and Simple Construction.' W. Tylar.—*Dated April* 14, 1886.

No. 5205.—'An Improved Method of Photographic Engraving.' E. W. Foxlee.—*Dated April* 14, 1886.

No. 5450.—'Improvements in Cameras.' W. Middlemiss.—*Dated April* 20, 1886.

No. 5544.—'Improvements in Stands for Supporting Cameras, Table Tops, Seats, or other Articles.' J. M. Farmer.—*Dated April* 21, 1886.

No. 5595.—'A New or Improved Process for Reproducing Photographs in Copperplate, Lithographic, or Printing Presses.' Communicated by L. Collardon and A. E. Barthel. L. A. Groth.—*Dated April* 22, 1886.

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No. 5849.—'Improvements in Appliances for the Optical Lantern.' G. DAVENPORT.—*Dated April* 30, 1886.

No. 5947.—'Improvements in Artists' Canvas Frames.' J. SIMS.—*Dated May* 1, 1886.

No. 5993.—'Improvements in Electro-Magnetic Retouching Pencils for Photographic Purposes.' Communicated by L. Fried and B. Iscovits. H. J. HADDAN.—*Dated May* 3, 1886.

No. 6289.—'A Folding Focussing Camera Screen for Photographic Purposes.' A. J. JAMOUNEAU.—*Dated May* 10, 1886.

No. 6316.—'Binocular Camera.' J. HANCOCK, jun.—*Dated May* 11, 1886.

No. 6318.—'An Apparatus for Washing and Drying Sun Copies of Drawings.' B. D. HEALEY.—*Dated May* 11, 1886.

No. 6359.—'An Improved Supporting Device for Cards, Photographs, Pictures, and the like.' Communicated by W. Hagelberg. J. C. FELL.—*Dated May* 11, 1886.

No. 6431.—'Improvements in Apparatus for Holding and Exhibiting Views and the like in Magic Lanterns.' J. T. KEY.—*Dated May* 13, 1886.

No. 6458.—'Improvements in the Method of and Means for Marking Photographic Negatives and the like.' Communicated by C. J. E. Kruse. N. BROWNE.—*Dated May* 13, 1886.

No. 6547.—'An Improved Substitute for the Opal or other Tinted Glass used for the Purpose of Producing Photographic Transparencies.' W. TURNER and G. J. TURNER.—*Dated May* 15, 1886.

No. 6590.—'Improvements in Frames for Holding Photographic and other Pictures.' R. MANDER.—*Dated May* 17, 1886.

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No. 7027.—'Improvements in Mounting Lenses for Photographic Purposes, to ensure Correct Exposure.' G. SMITH.—*Dated May* 25, 1886.

No. 7121.—'Improvements in Photographic Cameras.' G. LOWDEN.—*Dated May* 27, 1886.

No. 7155.—'Improvements in Photographic Cameras.' A. S. NEWMAN.—*Dated May* 27, 1886.

No. 7156.—'Improvements in Photographic Shutters.' A. S. NEWMAN.—*Dated May* 27, 1886.

No. 7344.—'Improved Slide Carrier for Magic Lanterns and Dissolving Views.' R. R. BEARD.—*Dated June* 1, 1886.

No. 7359.—'An Improvement in the Shutters of Photographic Dark Slides or Backs.' Complete specification. T. P. WATSON.—*Dated June* 1, 1886.

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No. 7531.—'An Improved Construction of Holder for Mounted Photographs and Pictures, and other Cards.' Complete specification. B. J. HEYWOOD.—*Dated June* 4, 1886.

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No. 7963.—'An Improved Process for Manufacturing Colour Sensitive (Isochromatic or Orthochromatic) Photographic Emulsions or Plates by Dyeing the same with Dyes Highly Sensitive to Light.' Complete specification. H. W. VOGEL.—*Dated June* 15, 1886.

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No. 8027.—'Improvements in Photographic Cameras.' H. N. HOUGHTON.—*Dated June* 16, 1886.

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No. 8076.—'An Improvement in Lantern Carriers, namely, an Automatic Frame for Using Various Sized Photographic Slides.' Complete specification. W. C. HUGHES.—*Dated June* 17, 1886.

No. 8089.—'Improvements in Protectors for Cards, Photographs, Books, and the like, during Transmission through the Post.' G. A. HEARN.—*Dated June* 17, 1886.

No. 8109.—'Improvements in Head Rests.' F. PROCTOR.—*Dated June* 18, 1886.

No. 8190.—'Improvements in or connected with Shutters for Photographic Camera Lenses.' Complete specification. A. E. MOORE.—*Dated June* 21, 1886.

No. 8257.—'Improvements in and relating to Photographic Cameras.' N. CONTI. *Dated June* 22, 1886.

No. 8262.—'A New or Improved Travelling Band for Machines used in Coating Photographic Plates.' A. COWAN.—*Dated June* 23, 1886.

No. 8329.—'Improvements in Changing Boxes for Photographic Cameras.' A. S. NEWMAN.—*Dated June* 24, 1886.

No. 8431.—'A Portable Photographic Developing Lamp and Railway Reading Lamp combined, to Burn Oil or Candle respectively, Folding Reflectors to Diffuse the Light when Open and Protect the Glass when Closed for Travelling.' J. M. COPELAND.—*Dated June* 26, 1886.

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No. 8821.—'Improvements in Dark Slides for Photographic Cameras.' G. LOWDON.—*Dated July* 6, 1886.

No. 8871.—'An Improved Method of Attaching Spring and Slide to Photographic Holders and the like Articles.' W. D. WILKINSON and W. H. RICHARDS.—*Dated July* 7, 1886.

No. 8884.—'Improvements in Apparatus for Coating Photographic Plates and Paper.' W. J. WILSON.—*Dated July* 7, 1886.

No. 8972.—'Improvements in Apparatus for Coating Photographic Plates.' M. P. ISMAY and E. DODDS.—*Dated July* 9, 1886.

No. 9077.—'Improvements in Drying Racks for Photographic and other Glass Plates.' M. P. ISMAY.—*Dated July* 12, 1886.

No. 9155.—'Improvements in Vignette Papers for Photography.' G. J. SERSHALL.—*Dated July* 14, 1886.

No. 9383.—'An Improved Device to allow of Rapidly Changing the Pictures in a Magic Lantern.' Complete specification. W. C. HUGHES.—*Dated July* 20, 1886.

No. 9413.—'Improvements in and relating to Solutions and Processes for Photographic Printing.' Communicated by R. B. West and B. C. West. Complete specification. H. H. LAKE.—*Dated July* 20, 1886.

No. 9460.—'Improvements in the manner of Applying Gelatine as a Substitute for Paper or Glass in the Manufacture of Dry Plates for Photographic Purposes.' J. BROWN.—*Dated July* 21, 1886.

No. 9469.—'Improvements in a Rolling Curtain Effect for Side-by-Side Lanterns, namely, a Diaphragm Shutter for Cutting off alternately in each the Rays of Light.' Complete specification. W. C. HUGHES.—*Dated July* 21, 1886.

No. 9513.—'Advertising Photograph Frame.' F. W. K. TARTE.—*Dated July* 22, 1886.

No. 9539.—'An Improved Photograph Frame.' H. JOHNSON.—*Dated July* 23, 1886.

No. 9545.—'Improvements in Stands or Supports for Photographs, Prints, Pictures, and other Articles.' A. ARBENZ and E. KUHN.—*Dated July* 23, 1886.

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No. 9645.—'Improvements in or connected with Photographic Cameras.' T. SAMUELS.—*Dated July* 26, 1886.

No. 9652.—'A New or Improved Method of and Means for Producing Positive Pictures from Photographic Negatives.' T. TURNER the Younger.—*Dated July* 27, 1886.

No. 9655.—'Improvement in Portable Photographic Cameras.' Communicated by C. P. Stirn. Complete specification. H. J. ALLISON.—*Dated July* 27, 1886.

No. 9756.—'Improvements relating to Stands or Supports for Photographic Cameras.' Communicated by G. McLaughlin. Complete specification. H. H. LAKE.—*Dated July* 28, 1886.

No. 9788.—'An Improved Photographic Shutter and Method of Operating the same.' A. PHILLIPS.—*Dated July* 29, 1886.

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No. 10,191.—'Improvements in Camera Slides.' W. MIDDLEMISS.—*Dated August* 10, 1886.

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No. 10,256.—'Improvements in Photographic Colour Printing.' S. H. CROCKER.—*Dated August* 11, 1886.

No. 10,317.—'Double Lantern Slide Carrier for Centering the same.' J. PLACE.—*Dated August* 12, 1886.

No. 10,411.—'Improvements in Dissolving Apparatus for Optical Lanterns.' Communicated by G. R. Prowse. F. BARBER.—*Dated August* 14, 1886.

No. 10,439.—'A Process for obtaining from Photographic Negatives Formes for Lithographic or Letterpress Printing.' J. H. BUXTON, H. H. SHANKS, and C. H. EVANS.—*Dated August* 14, 1886.

No. 10,483.—'A Photographic Process for Printing in Colours.' J. C. HÖSCH.—*Dated August* 16, 1886.

No. 10,500.—'Improvements in Apparatus for Producing Optical Illusions. G. W. JONES.—*Dated August* 16, 1886.

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No. 10,770.—'Improvements in Photographic Printing Machines.' J. URIE, sen., and J. URIE, jun.—*Dated August* 23, 1886.

No. 11,231.—'A New or Improved Machine for Cutting Photographic and other Glass Plates.' B. J. EDWARDS.—*Dated September* 3, 1886.

No. 11,305.—'An Improvement in Photographic Dark Room Lamps.' H. LUCAS.—*Dated September* 6, 1886.

No. 11,365.—'An Improved Portable Photographic Apparatus, called the Photo-eclair Fetler.' Communicated by J. F. Fetler. H. J. COOKE.—*Dated September* 7, 1886.

No. 11,429.—'Improvements in and connected with Electrically or otherwise Working or Controlling from a Distance the Slides in Magic Lanterns or in other Lanterns for Theatrical and other Effects.' C. LEVER.—*Dated September* 8, 1886.

No. 11,551.—'Improvements in Telegraphy by means of a System of Phototelegraphy.' W. LUCAS and T. A. GARRETT.—*Dated September* 11, 1886.

No. 11,557.—'Improvements in the Manufacture of Liquid Gum for Mounting Photographs, Lithographic Printing, Commercial and Domestic Use.' E. M. KNIGHT.—*Dated September* 11, 1886.

No. 11,597.—'Improvements in Frames for holding Transparent and other Photographs and Pictures, Mirrors, and the like.' R. MANDER.—*Dated September* 13, 1886.

No. 11,606.—'Improvements in the Dark Roller Slide for Photographic Cameras.' A. GACHE.—*Dated September* 13, 1886.

No. 11,735.—'Improvements in Photographic Shutters.' C. D. DURNFORD. —*Dated September* 15, 1886.

No. 12,060.—'A Portable Photographic Camera and Stand.' G. J. MICHEL. *Dated September* 22, 1886.

No. 12,063.—'Improvements in Photographic Plates.' Communicated by G. E. Thiellement. A. C. HENDERSON.—*Dated September* 22, 1886.

No. 12,087.—'A "Finder" for Photographic Purposes.' F. W. BRANSON.—*Dated September* 23, 1886.

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'GENTLEMEN,—I am much pleased with the Daylight Enlarging Camera, which is well adapted for its work, and well made.
'Yours faithfully, R. TIDDEMAN.'

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No. 12,238.—'Improvements in Lens, Shutters, and Camera Fronts.' J. E. THORNTON.—*Dated September* 27, 1886.

No. 12,250.—'Photographic Camera Lens Shutter.' J. SWIFT.—*Dated September* 27, 1886.

No. 12,255.—'Producing Hyposulphite of Soda for Antichlor, Photography, &c.' Complete specification. T. RAYNAUD.—*Dated September* 27, 1886.

No. 12,456.—'Improvements in Photographic Studios and Backgrounds. H. V. WEYDE.—*Dated October* 1, 1886.

No. 12,571.—'A New or Improved Pocket or Portable Apparatus for the Taking of Photographic Pictures.' W. J. LANCASTER.—*Dated October* 4, 1886.

No. 12,577.—'A New Apparatus to Produce Divided Images for Photography and Typography.' T. L. M. HARE and B. C. LE MOUSSU.—*Dated October* 4, 1886.

No. 12,940.—'A New or Improved Stand or Holder for Holding and Supporting Cards, Photographs, and the like." C. DIBDIN.—*Dated October* 11, 1886.

No. 13,011.—'A Process and Apparatus for the Manufacture of Pyroxyline.' Communicated by G. M. Mowbray. Complete specification. O. IMRAY.—*Dated October* 12, 1886.

No. 13,052.—'An Improved Method of Sinking the Surfaces of Steel Dies, Stamps, and Punches, by means of Combined Photographic and Etching Processes, and for the Apparatus employed in this Operation.' W. F. STANLEY.—*Dated October* 13, 1886.

No. 13,090.—'An Envelope for Dry Sensitive Plates for Photographic Purposes.' F. H. ANDERTON and G. W. ELLIOTT.—*Dated October* 14, 1886.

No. 13,198.—'Improvements in Stands for Holding and Displaying Photographic and other Views.' W. H. RICHARDS.—*Dated October* 16, 1886.

No. 13,240.—'Improvements in Cameras.' J. E. THORNTON.—*Dated October* 18, 1886.

No. 13,279.—'Facilitating the Exposing, Storing, and Changing of Sensitised Material in Carriers for the Purposes of Photography, called the "Acme Dark Slide and Changing Box."' F. HOUGHTON.—*Dated October* 18, 1886.

No. 13,467.—'Improved Apparatus for Taking Photographic Pictures.' N. E. BOYD.—*Dated October* 21, 1886.

No. 13,480.—'Improved Apparatus to be Employed in Printing Photographic Vignettes.' W. BROOKES.—*Dated October* 22, 1886.

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—For Contact Printing from Dry-Plate Negatives.
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No. 13,549.—'An Improved Photographic Camera.' W. Brookes.—*Dated October* 23, 1886.

No. 13,580.—'An Improved Process of Producing and Transferring Photographs.' Communicated by C. T. Cain. A. M. Clark.—*Dated October* 23, 1886.

No. 13,620.—'Improvements in Tripod Camera Stands. A. W. Dollond. —*Dated October* 25, 1886.

No. 13,778.—'An Improved Apparatus for Holding and Displaying Photographs and the like.' J. Harper.—*Dated October* 27, 1886.

No. 13,783.—'Improvements in Frames for Displaying Photographs, Advertisements, and the like.' W. Moffatt and W. Scott.—*Dated October* 27, 1886.

No. 13,825.—'Improvements in Changing Boxes for Photographic Purposes.' A. W. Dollond.—*Dated October* 28, 1886.

No. 14,099.—'Improvements in Apparatus for Washing Photographic Prints.' A. Kellar.—*Dated November* 2, 1886.

No. 14,120.—'Improvements in the Production of Coloured Photographic Pictures.' E. W. Parkes.—*Dated November* 2, 1886.

No. 14,131.—'The Treatment of Wood, Stone, and other Suitable Material for Producing Artistic and other Effects on the Surface thereof by the Photographic Art.' W. H. Smith.—*Dated November* 3, 1886.

No. 14,262.—'Improvements in the Construction of Photographic Cameras.' H. Park.—*Dated November* 5, 1886.

No. 14,410.—'An Improved Photographic Shutter and Method of Actuating the same.' J. T. Mayfield and J. T. Todman.—*Dated November* 8, 1886.

No. 14,421.—"A Holder for Lens Diaphragms in Cameras." J. E. Thornton.—*Dated November* 9, 1886.

No. 14,547.—'Improvements in the Process of Printing from Photographic Negatives and Apparatus therefor.' J. E. Dessendier.—*Dated November* 10, 1886.

No. 14,548.—'A New or Improved Photometer for use in Photography.' J. E. Dessendier.—*Dated November* 10, 1886.

No. 14,549.—''Improvements in the Process of and Apparatus for Printing from Photographic Negatives.' J. E. Dessendier.—*Dated November* 10, 1886.

No. 14,723.—'Improvements in Photographic Cameras.' S. D. McKellen. —*Dated November* 13, 1886.

No. 14,830.—'The Further Convenience in the Manipulation of Photographic Dark Slides.' C. J. Murton.—*Dated November* 16, 1886.

No. 15,000.—'Coin Receiver and Deliverer for Exhibition of Photographic or Stereoscopic Views in Fixed Quantities.' W. S. Simpson.—*Dated November* 18, 1886.

No. 15,093.—'Showing Photographs through a Frame inserted in a Box, Album, or Photograph Cabinet.' S. T. Lander.—*Dated November* 20, 1886.

No. 15,187.—'A New or Improved Combined Photographic Camera and Photographic Enlarging Lantern and Magic Lantern.' W. P. O'Reilly.—*Dated November* 22, 1886.

No. 15,441.—'Apparatus for Manufacturing Photographic Dry Plates.' W. J. Wilson.—*Dated November* 26, 1886.

No. 15,532.—'An Improved Process for Manufacturing Isochromatic Emulsion Plates Highly Sensitive to Light.' Complete specification. H. W. Vogel —*Dated November* 29, 1886.

THE 'ILFORD'
DRY PLATES

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Size	8½ × 4¼	8½ × 6½	9 × 7	10 × 8	12 × 10	15 × 12	
Price	3/2	4/3	5/-	7/3	10/6	18/-	per doz.

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Size	¼	5 × 4	6½ × 4¼	6½ × 4¾	7¼ × 4½	7½ × 5	
Price	1/3	2/-	2/9	3/-	3/8	4/6	per doz.
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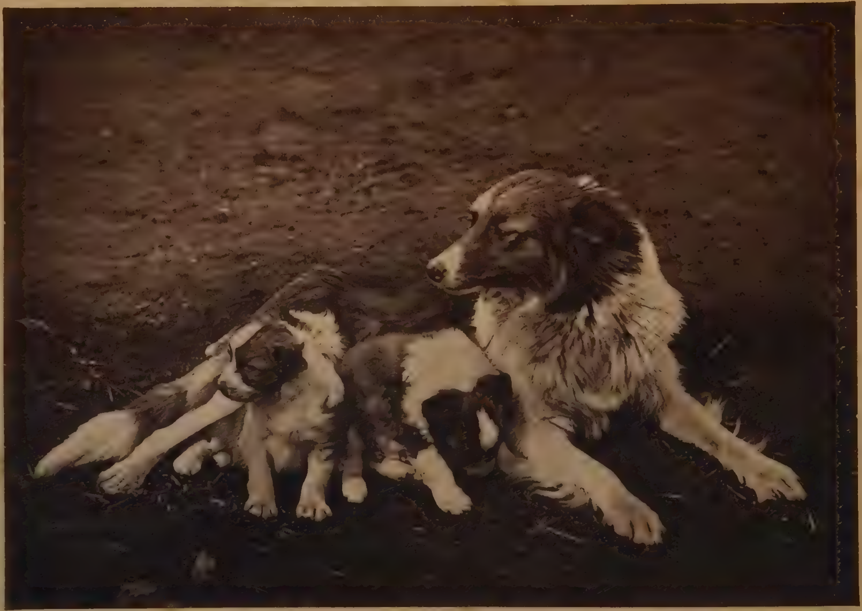

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COLLIE AND PUPS.

THE YEAR-BOOK OF PHOTOGRAPHY.

ECLIPSES IN 1887.

During the year 1887 there will be two Eclipses of the Sun, and two of the Moon.

February 8th.—Partial Eclipse of the Moon, invisible at Greenwich.

February 22nd, 23rd.—Annular Eclipse of the Sun, invisible at Greenwich.

August 3rd.—Partial Eclipse of the Moon, visible at Greenwich.

August 19th.—Total Eclipse of the Sun, part visible as a Partial Eclipse at Greenwich.

LAW SITTINGS.

Hilary	Begins	January	11	Ends	April	6
Easter	,,	April	19	,,	May	27
Trinity	,,	June	7	,,	August	12
Michaelmas	,,	October	24	,,	December	21

CHRONOLOGICAL NOTES.

Golden Number	7	Roman Indiction	15
Epact	6	Dominical Letter	B
Solar Cycle	20	Julian Period	6600

FESTIVALS, ETC.

Epiphany	Jan.	6	Ascension Day — Holy Thursday	May	19
Septuagesima Sunday	Feb.	6	Birth of Queen Victoria	,,	24
Quinquagesima—Shrove Sunday	,,	20	Pentecost—Whit Sunday	,,	29
Ash Wednesday	,,	23	Trinity Sunday	June	5
Quadragesima — 1st Sunday in Lent	,,	27	Corpus Christi	,,	9
St. David	Mar.	1	Accession of Queen Victoria	,,	20
St. Patrick	,,	17	Proclamation	,,	21
Annunciation—Lady Day	,,	25	St. John Baptist — Midsummer Day	,,	24
Palm Sunday	April	3	St. Michael—Michlms. Day	Sept.	29
Good Friday	,,	8	Birth of Prince of Wales	Nov.	9
Easter Sunday	,,	10	1st Sunday in Advent	,,	27
Low Sunday	,,	17	St. Andrew	,,	30
St. George	,,	23	St. Thomas	Dec.	21
Rogation Sunday	May	15	Christmas Day	,,	25

The year 5648 of the Jewish Era commences on September 19, 1887.

Ramadan (Month of Abstinence observed by the Turks) commences on May 24, 1887.

The year 1305 of the Mohammedan Era commences on September 19, 1887.

THE SEASONS.

Spring Quarter begins	March 20	Autumn Quarter begins	Sept. 28
Summer ,, ,,	June 21	Winter ,, ,,	Dec. 21

JANUARY—31 DAYS.

D M	D W	MEMORANDA.	Sun.		Moon.		High Water.	
			Rises.	Sets.	Rises.	Sets.	Morn.	After.
			H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	S	New Year's Day	8 8	3 59	11 35	11 35	6 4	6 26
2	𝕾	2nd Sunday aft. Christ.	8 8	4 0	After.	Morn	6 46	7 10
3	M	Day breaks 6h. 2m.	8 8	4 1	0 19	0 38	7 35	8 2
4	Tu	Saturn rises 4h. 21m. aft.	8 8	4 3	0 43	1 43	8 30	9 3
5	W	Clock fast 5m. 37s.	8 8	4 4	1 10	2 50	9 41	10 17
6	Th	Twelfth Day	8 7	4 5	1 42	3 57	10 51	11 22
7	F	Fire Ins. expires (8)	8 7	4 6	2 22	5 4	11 52	—
8	S	Pr. Albert Victor b. 1864	8 7	4 8	3 11	6 10	0 19	0 43
9	𝕾	1st Sunday af. Epiphany.	8 6	4 9	4 10	7 11	1 8	1 31
10	M	Penny Post com. 1840	8 6	4 10	5 18	8 4	1 55	2 17
11	Tu	Berenger d. 1876	8 5	4 12	6 33	8 50	2 37	3 0
12	W	Jupiter r. 1h. 38m. morn.	8 4	4 13	7 52	9 29	3 22	3 45
13	Th	Hilary	8 4	4 15	9 11	10 1	4 9	4 32
14	F	Oxf. Lent Term beg.	8 3	4 16	10 30	10 30	4 54	5 18
15	S	G. W. Simpson d. 1880	8 2	4 18	11 47	10 57	5 40	6 5
16	𝕾	2nd Sunday aft. Epiphany	8 1	4 19	Morn	11 23	6 31	6 56
17	M	Alfieri (poet) b. 1749	8 0	4 21	1 2	After	7 24	7 53
18	Tu	O. G. Rejlander d. 1875	7 59	4 22	2 15	0 22	8 23	8 57
19	W	Victor Regnault d. 1878	7 58	4 24	3 25	0 56	9 36	10 15
20	Th	Lond. Photo. Soc. estab.'53	7 57	4 26	4 32	1 36	10 52	11 29
21	F	W. H. Fox Talbot b. 1800	7 56	4 27	5 33	2 21	—	0 3
22	S	Zulu war com. 1879	7 55	4 29	6 27	3 13	0 34	1 0
23	𝕾	3rd Sunday aft. Epiph	7 54	4 31	7 13	4 10	1 26	1 49
24	M	Adam Black died 1874	7 53	4 33	7 51	5 11	2 10	2 28
25	Tu	Princess Royal mar. 1858	7 51	4 34	8 24	6 13	2 47	3 5
26	W	Fall of Kartoum 1885	7 50	4 36	8 52	7 16	3 21	3 38
27	Th	New S. Wales founded 1788	7 49	4 38	9 17	8 19	3 56	4 13
28	F	Mercury r. 7h. 44m. morn	7 47	4 40	9 40	9 22	4 29	4 46
29	S	First Reformed Parl. 1833	7 46	4 41	10 2	10 25	5 1	5 17
30	𝕾	4th Sunday. a. Epiph.	7 45	4 43	10 23	11 28	5 33	5 50
31	M	Launch *Great Eastern* '58	7 43	4 45	10 46	Morn	6 7	6 27

MOON'S PHASES.

First Quarter,	2nd day, 0h. 21m. A.	*Last Quarter,*	16th day, 3h. 22m. A.
Full Moon,	9th day, 10h. 45m. A.	*New Moon,*	24th day, 3h. 1m. M.

MORNING AND EVENING STARS.

Mercury, *Morning Star*; conjunction with Moon, 23rd.
Venus, *Evening Star*; conjunction with Moon, 25th.
Mars, *Evening Star.*
Jupiter, *Morning Star*; conjunction with Moon, 17th; quad. with Sun, 25th.

FEBRUARY—28 DAYS.

D M	D W	MEMORANDA.	Sun.		Moon.		High Water.	
			Rises.	Sets.	Rises.	Sets.	Morn.	After.
			H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	Tu	B. Delessert d. 1868	7 42	4 47	11 11	0 32	6 47	7 10
2	W	Quarter Day (Scotland)	7 40	4 49	After	1 38	7 35	8 3
3	Th	Marq. Salisbury b. 1830	7 38	4 50	0 14	2 44	8 33	9 9
4	F	Saturn sets 6h. 27m. morn.	7 37	4 52	0 56	3 49	9 51	10 31
5	S	Thomas Carlyle d. 1881	7 35	4 54	1 49	4 51	11 8	11 43
6	𝕾	Septuagesima Sunday	7 33	4 56	2 52	5 48	—	0 17
7	M	Day breaks 5h. 36m.	7 31	4 58	4 4	6 39	0 45	1 11
8	Tu	Half Quarter Day	7 30	5 0	5 23	7 21	1 36	2 1
9	W	Jupiter rises 11h. 55m. aft.	7 28	5 1	6 45	7 58	2 24	2 46
10	Th	Sir D. Brewster d. 1868	7 27	5 3	8 7	8 30	3 8	3 31
11	F	Lond. University fnd. 1826	7 25	5 5	9 28	8 59	3 53	4 16
12	S	Custom House bt. 1814	7 23	5 7	10 47	9 26	4 36	5 2
13	𝕾	Sexagesima Sunday	7 21	5 9	Morn	9 55	5 23	5 45
14	M	St. Valentine's Day	7 19	5 11	0 4	10 25	6 8	6 32
15	Tu	Clock fast 14m. 21s.	7 17	5 13	1 17	10 58	6 56	7 22
16	W	Day increased 2 14	7 15	5 14	2 26	After	7 50	8 23
17	Th	Twilight ends 7h. 9m.	7 13	5 16	3 28	0 19	8 59	9 41
18	F	Martin Luther d. 1546	7 11	5 18	4 23	1 8	10 24	11 6
19	S	Copernicus born 1473	7 9	5 20	5 11	2 3	11 43	—
20	𝕾	Shrove Sunday	7 7	5 22	5 52	3 2	0 17	0 48
21	M	Bingham d. 1870	7 5	5 23	6 26	4 3	1 12	1 34
22	Tu	Shrove Tuesday	7 3	5 25	6 55	5 6	1 55	2 14
23	W	Ash Wednesday	7 1	5 27	7 21	6 9	2 30	2 47
24	Th	St. Matthew	6 59	5 29	7 44	7 12	3 3	3 19
25	F	Hare hunt. ends	6 57	5 31	8 6	8 16	3 33	3 48
26	S	Arago b. 1786	6 55	5 33	8 28	9 19	4 3	4 19
27	𝕾	1st Sunday in Lent	6 53	5 34	8 50	10 22	4 33	4 48
28	M	Hare hunting ends	6 51	5 36	9 14	11 26	5 3	5 18

MOON'S PHASES.

First Quarter,	1st day, 8h. 27m. M.	*Last Quarter,*	15th day, 1h. 32m. M.
Full Moon,	8th day, 10h. 14m. M.	*New Moon,*	22nd day, 9h. 40m. A.

MORNING AND EVENING STARS,

Mercury, *Evening Star* towards end of month; superior conjunction with Sun, 6th; conjunction with Mars, 23rd, and with Moon, 24th.

Venus, *Evening Star;* conjunction with Mars, 10th, and with Moon, 24th.

Mars, *Evening Star*; conjunction with Moon, 24th.

Jupiter, *Morning Star*; conjunction with Moon, 13th.

Saturn, *Evening Star.*

MARCH—31 DAYS.

D M	D W	MEMORANDA.	Sun.		Moon.		High Water.	
			Rises.	Sets.	Rises.	Sets.	Morn.	After.
			H. M.	H. M.	H. M.	H M.	H. M.	H. M.
1	Tu	St. David	6 49	5 38	9 40	Morn	5 34	5 50
2	W	Ember Week	6 46	5 39	10 12	0 30	6 9	6 30
3	Th	Clock fast 12m. 9s.	6 44	5 41	10 49	1 34	6 52	7 19
4	F	A. Poitevin d. 1882	6 42	5 43	After	2 36	7 48	8 21
5	S	Cath. Emancip. Bill 1829	6 40	5 45	0 32	3 34	9 1	9 48
6	S	2nd Sunday in Lent	6 38	5 46	1 38	4 26	10 31	11 12
7	M	Perpetua	6 36	5 48	2 52	5 11	11 50	—
8	Tu	Night long 12 44	6 33	5 50	4 12	5 50	0 24	0 52
9	W	Jupiter rises 10h. 2m. aft.	6 31	5 52	5 35	6 24	1 17	1 41
10	Th	Prince of Wales mar. 1863	6 29	5 53	6 59	6 55	2 5	2 27
11	F	Income Tax imposed 1842	6 26	5 55	8 22	7 25	2 48	3 11
12	S	Laborde d. 1869	6 24	5 57	9 43	7 53	3 33	3 54
13	S	3rd Sunday in Lent	6 22	5 59	11 0	8 23	4 17	4 40
14	M	King of Italy b. 1844	6 20	6 0	Morn	8 56	5 0	5 22
15	Tu	Steinbach d. 1869	6 17	6 2	0 13	9 34	5 42	6 4
16	W	Twilight ends 7h. 57m.	6 15	6 4	1 20	10 17	6 28	6 52
17	Th	St. Patrick's Day	6 13	6 5	2 19	11 5	7 20	7 51
18	F	Princess Louise b. 1848	6 11	6 7	3 10	After	8 27	9 7
19	S	Corn Law League 1839	6 8	6 9	3 53	0 56	9 53	10 38
20	S	4th Sunday in Lent	6 6	6 11	4 29	1 57	11 19	11 54
21	M	Archbp. Cranmer bt. 1556	6 4	6 12	4 59	2 59	—	0 23
22	Tu	Goethe d. 1832	6 2	6 14	5 25	4 2	0 50	1 12
23	W	Woodbury's Photo-relief	5 59	6 15	5 49	5 5	1 32	1 50
24	Th	Day breaks 4h. [Pat. '65	5 57	6 17	6 12	6 8	2 6	2 22
25	F	Lady Day	5 55	6 19	6 33	7 11	2 36	2 52
26	S	Prof. T. H. Green d. 1882	5 52	6 21	6 55	8 15	3 6	3 20
27	S	5th Sunday in Lent	5 50	6 22	7 18	9 19	3 35	3 50
28	M	Duke of Albany d. 1884	5 48	6 24	7 43	10 22	4 6	4 20
29	Tu	Keble d. 1866	5 46	6 25	8 13	11 26	4 36	4 51
30	W	Balard d. 1876	5 43	6 27	8 48	Morn	5 7	5 25
31	Th	Italian Kingd. recog. 1861	5 41	6 29	9 30	0 28	5 43	6 3

MOON'S PHASES.

First Quarter,	3rd day, 1h. 8m. M.	*Last Quarter,*	16th day, 1h. 42m. A.
Full Moon,	9th day, 8h. 34m. A.	*New Moon,*	24th day, 4h. 10m. A.

MORNING AND EVENING STARS.

Mercury, *Evening Star* first part of month ; in perihelion, 3rd ; greatest elongation, 5th ; inf. conjunction with Sun, 22nd ; conjunction with Moon, 24th.
Venus, *Evening Star* ; conjunction with Moon, 27th.
Mars, *Evening Star.*
Jupiter rises on 1st at 10.36 p.m.

APRIL—30 DAYS.

D M	D W	MEMORANDA.	SUN.		MOON.		HIGH WATER.	
			RISES	SETS.	RISES.	SETS.	MORN.	AFTER.
			H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	F	Bismarck b. 1815	5 39	6 30	10 20	1 26	6 26	6 53
2	S	Oxford Lent Term ends	5 36	6 32	After	2 18	7 21	7 56
3	𝕾	PALM SUNDAY	5 34	6 34	0 28	3 4	8 34	9 18
4	M	St. Ambrose	5 32	6 35	1 43	3 44	10 4	10 48
5	TU	J. B. Reade b. 1801	5 30	6 37	3 3	4 19	11 25	11 59
6	W	Dividends payable	5 27	6 39	4 25	4 51	—	0 29
7	TH	Maundy Thursday	5 25	6 40	5 48	5 20	0 54	1 18
8	F	GOOD FRIDAY	5 23	6 42	7 11	5 49	1 40	2 1
9	S	Fire Insurance expires	5 21	6 44	8 33	6 19	2 24	2 47
10	𝕾	EASTER SUNDAY	5 19	6 45	9 51	6 51	3 9	3 32
11	M	EASTER MOND. Bank Hol.	5 16	6 47	11 4	7 27	3 53	4 16
12	TU	EASTER TUESDAY	5 14	6 49	Morn	8 8	4 38	4 58
13	W	Oxford Easter Term beg.	5 12	6 50	0 9	8 56	5 20	5 42
14	TH	Princess Beatrice b. 1857	5 10	6 52	1 5	9 49	6 5	6 29
15	F	Sir James Ross b. 1800	5 8	6 54	1 52	10 47	6 57	7 26
16	S	Battle of Culloden 1746	5 5	6 55	2 30	After	7 58	8 34
17	𝕾	LOW SUNDAY	5 3	6 57	3 3	0 50	9 15	9 59
18	M	Baron Liebig d. 1873	5 1	6 59	3 31	1 53	10 39	11 14
19	TU	Lord Beaconsfield d. 1881	4 59	7 0	3 55	2 55	11 46	—
20	W	J. A. Spencer d. 1878	4 57	7 2	4 17	3 58	0 14	0 36
21	TH	Mars sets 7h. 7m. aft.	4 55	7 4	4 38	5 2	0 56	1 15
22	F	Odessa bomb. 1854	4 53	7 5	5 0	6 5	1 33	1 49
23	S	St. George	4 51	7 7	5 22	7 10	2 5	2 19
24	𝕾	2nd SUNDAY after EASTER	4 49	7 9	5 47	8 15	2 35	2 50
25	M	Princess Alice b. 1843	4 47	7 10	6 15	9 20	3 5	3 21
26	TU	Venus sets 10h. 31m. aft.	4 45	7 12	6 48	10 23	3 38	3 54
27	W	Prince Leopold mar. 1882	4 43	7 14	7 28	11 22	4 13	4 31
28	TH	Queen proc. Emp. India '76	4 41	7 15	8 15	Morn	4 47	5 5
29	F	Twilight ends 9h. 43m.	4 39	7 17	9 11	0 16	5 24	5 47
30	S	Artisans' Dwllngs. Bill '75	4 37	7 18	10 15	1 4	6 12	6 38

MOON'S PHASES.

First Quarter, 1st day, 1h. 53m. A. | *Last Quarter*, 15th day, 4h. 4m. M.
Full Moon, 8th day, 5h. 39m. M. | *New Moon*, 23rd day, 8h. 53m.
First Quarter, 30th day, 11h. 0m. A.

MORNING AND EVENING STARS.

Mercury, *Morning Star* ; stationary, 3rd ; in aphelion, 15th ; greatest westerly elongation, 18th ; conjunction with Moon, 20th.

Venus, *Evening Star* ; conjunction with Moon, 26th.

Mars, *Evening Star* first part of month ; conjunction with Moon, 23rd.

Jupiter, *Evening Star* ; conjunction with Moon, 9th.

MAY—31 DAYS.

D M	D W	MEMORANDA.	SUN.		MOON.		HIGH WATER.	
			RISES.	SETS.	RISES.	SETS.	MORN.	AFTER.
			H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	𝔖	3rd SUNDAY after EASTER	4 35	7 19	After	1 45	7 9	7 41
2	M	Stock Exchange closed	4 33	7 21	0 41	2 20	8 20	9 0
3	TU	Clock slow 3m. 14s.	4 31	7 23	2 0	2 51	9 42	10 22
4	W	Saturn sets 0h. 40m. morn.	4 29	7 25	3 20	3 20	10 58	11 32
5	TH	Niepce's first Cam. Pic. '11	4 28	7 27	4 41	3 47	—	0 1
6	F	Humboldt d. 1859	4 26	7 28	6 3	4 15	0 26	0 51
7	S	Indian Mutiny 1857	4 24	7 30	7 24	4 45	1 17	1 41
8	𝔖	4th SUNDAY after EASTER	4 22	7 31	8 41	5 19	2 3	2 26
9	M	Gay Lussac d. 1850	4 21	7 33	9 52	5 58	2 47	3 10
10	TU	S. Lond. Ph. Soc. fnd. 1859	4 19	7 34	10 54	6 43	3 31	3 54
11	W	H. B. Pritchard d. 1884	4 17	7 36	11 46	7 35	4 16	4 37
12	TH	Sir J. Herschel d. 1871	4 16	7 38	Morn	8 33	4 58	5 20
13	F	Old May Day	4 14	7 39	0 30	9 34	5 42	6 7
14	S	Fahrenheit b. 1686	4 13	7 41	1 5	10 37	6 32	6 59
15	𝔖	ROGATION SUNDAY	4 11	7 42	1 34	After	7 28	7 58
16	M	Chas. Breese d. 1875	4 10	7 44	2 0	0 44	8 32	9 10
17	TU	Rev. New Test. pub. 1881	4 8	7 45	2 23	1 47	9 49	10 23
18	W	New Eddystone op. 1882	4 7	7 47	2 44	2 51	10 55	11 25
19	TH	[Act 1875	4 5	7 48	3 5	3 55	11 51	—
20	F	Metric System English	4 4	7 49	3 27	4 59	0 15	0 35
21	S	Scheele d. 1786	4 3	7 51	3 50	6 4	0 54	1 12
22	𝔖	SUNDAY after ASCENSION	4 1	7 52	4 17	7 10	1 31	1 49
23	M	Mark Lemon d. 1870	4 0	7 54	4 48	8 15	2 6	2 22
24	TU	Queen Victoria b. 1819	3 59	7 55	5 26	9 17	2 40	2 57
25	W	T. J. Pearsall d. 1883	3 58	7 56	6 11	10 14	3 15	3 33
26	TH	Augustin	3 57	7 57	7 4	11 5	3 53	4 13
27	F	East. Law S. e.; Oxf. T. e.	3 56	7 59	8 6	11 48	4 32	4 53
28	S	Oxford Trin. Term begins	3 55	8 0	9 15	Morn	5 13	5 35
29	𝔖	WHIT SUNDAY	3 54	8 1	10 28	0 24	6 2	6 30
30	M	Bank Holiday	3 53	8 2	After	0 55	6 59	7 31
31	TU	Charlotte Bronte d. 1855	3 52	8 3	1 2	1 23	8 5	8 41

MOON'S PHASES.

Full Moon,	7th day, 2h. 1m. A.	*New Moon,*	22nd day, 11h. 5m. A.
Last Quarter,	14th day, 8h. 17m. A.	*First Quarter,*	30th day, 5h. 20m. M.

MORNING AND EVENING STARS.

Mercury, *Morning Star* greater part of month; conjunction with Mars and the Moon, 22nd; in perihelion, 29th.

Venus, *Evening Star*; in perihelion, 1st; conjunction with Moon, 26th.

Mars, *Morning Star*; conjunction with Moon, 22nd.

Jupiter, *Evening Star.*

JUNE—30 DAYS.

D M	D W	MEMORANDA.	SUN.				MOON.				HIGH WATER.			
			RISES.		SETS.		RISES.		SETS.		MORN.		AFTER.	
			H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	W	1st Amer. Phot. Conv. '69	3	51	8	5	2	20	1	50	9	20	9	55
2	TH	Niepce's Helio. Pro. 1851	3	50	8	6	3	40	2	17	10	29	11	2
3	F	Erasmus	3	49	8	7	5	0	2	45	11	34	—	
4	S	Tessie du Mothay d. 1880	3	49	8	8	6	17	3	16	0	3	0	29
5	𝕾	TRINITY SUNDAY	3	48	8	9	7	31	3	51	0	55	1	21
6	M	Day increased 8 38	3	47	8	10	8	38	4	32	1	45	2	9
7	TU	Fraunhofer d. 1826	3	47	8	10	9	36	5	20	2	31	2	54
8	W	Day long 16 25	3	46	8	11	10	24	6	15	3	16	3	38
9	TH	C. Delessert d. 1876	3	46	8	12	11	4	7	16	3	59	4	19
10	F	Crystal Palace op. 1854	3	46	8	13	11	37	8	20	4	41	5	2
11	S	St. Barnabas	3	45	8	14	Morn		9	25	5	22	5	43
12	𝕾	1st SUN. after TRINITY	3	45	8	14	0	4	10	30	6	5	6	29
13	M	Dr. Thos. Young b. 1773	3	45	8	15	0	38	After		6	53	7	18
14	TU	Night long 7 29	3	44	8	15	0	50	0	38	7	44	8	14
15	W	Mars rises 2h. 56m. morn.	3	44	8	16	1	11	1	41	8	45	9	19
16	TH	Day long 16 32	3	44	8	16	1	32	2	45	9	52	10	24
17	F	John Wesley b. 1703	3	44	8	17	1	54	3	50	10	54	11	22
18	S	Bat. Waterloo 1815	3	44	8	17	2	19	4	56	11	48	—	
19	𝕾	2nd SUN. after TRINITY	3	44	8	18	2	48	6	2	0	13	0	35
20	M	Acces. Qn. Victoria 1836	3	44	8	18	3	23	7	6	0	56	1	17
21	TU	Proc. Day. Longest day	3	44	8	18	4	5	8	6	1	38	1	58
22	W	Brazilian Cable laid 1874	3	45	8	18	4	56	9	0	2	18	2	37
23	TH	Toovey's Phot-lith. Pat.'63	3	45	8	19	5	56	9	47	2	57	3	17
24	F	Midsummer Day	3	45	8	19	7	4	10	27	3	38	4	0
25	S	Sismondi (hist.) d. 1842	3	46	8	19	8	17	11	0	4	21	4	43
26	𝕾	3rd SUN. after TRINITY	3	46	8	19	9	34	11	29	5	6	5	30
27	M	J. Wothly d. 1873	3	46	8	19	After		11	56	5	54	6	21
28	TU	Q. Victoria crowned 1837	3	47	8	19	0	8	Morn		6	49	7	18
29	W	Rubens b. 1577	3	47	8	18	1	25	0	22	7	47	8	18
30	TH	Great Comet 1861	3	48	8	18	2	43	0	48	8	51	9	27

MOON'S PHASES.

Full Moon,	5th day, 10h. 38m. A.	*New Moon,*	21st day, 10h. 53m. M.
Last Quarter,	13th day, 1h. 35m. A.	*First Quarter,*	28th day, 10h. 1m. M.

MORNING AND EVENING STARS.

Mercury, *Evening Star*; conjunction with Saturn, 20th, and Moon, 23rd.

Venus, *Evening Star*; conjunction with Moon 25th.

Mars, *Morning Star*; conjunction with Moon, 20th.

Jupiter, *Evening Star*; conjunction with Moon, 2nd and 26th.

Saturn, *Evening Star.*

JULY—31 DAYS.

D M	D W	MEMORANDA.	Sun.		Moon.		High Water.	
			Rises.	Sets.	Rises.	Sets.	Morn.	After.
			H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	F	Battle of the Boyne 1690	3 49	8 18	4 0	1 17	10 1	10 34
2	S	Sir Robert Peel d. 1850	3 49	8 18	5 14	1 49	11 7	11 41
3	𝔖	4th Sunday after Trinity	3 50	8 17	6 22	2 27	—	0 12
4	M	Amer. Independ. dec. 1776	3 51	8 17	7 24	3 11	0 40	1 6
5	Tu	J. N. Niepce d. 1833	3 51	8 16	8 17	4 3	1 31	1 56
6	W	Prs. Vict. of W. b. 1868	3 52	8 16	9 1	5 1	2 19	2 40
7	Th	Thos. à Becket	3 53	8 15	9 37	6 4	3 2	3 23
8	F	Clock fast 4m. 44s.	3 54	8 15	10 6	7 9	3 42	4 4
9	S	Oxford Trinity Term ends	3 55	8 14	10 32	8 15	4 23	4 42
10	𝔖	5th Sunday aft. Trinity	3 56	8 13	10 55	9 20	5 1	5 19
11	M	Dr. Miller d. 1880	3 57	8 13	11 16	10 23	5 37	5 57
12	Tu	Wedgwood b. 1730	3 58	8 12	11 36	After	6 17	6 38
13	W	Abbé Moigno d. 1884	3 59	8 11	11 57	0 30	7 0	7 23
14	Th	Jupiter sets 1h. 28m. aft.	4 0	8 10	Morn	1 34	7 47	8 14
15	F	St. Swithin [& Prov.	4 1	8 9	0 20	2 39	8 44	9 16
16	S	A. Claudet b. 1797	4 3	8 8	0 47	3 45	9 52	10 27
17	𝔖	6th Sunday after Trinity	4 4	8 7	1 19	4 50	10 59	11 30
18	M	Mars rises 2h. 13m. morn.	4 5	8 6	1 58	5 52	11 58	—
19	Tu	Prs. Augusta of C. b. '22	4 6	8 5	2 45	6 50	0 25	0 49
20	W	Army Purchase abol. 1871	4 7	8 3	3 42	7 41	1 13	1 36
21	Th	Day decreased 0 40	4 9	8 2	4 48	8 25	1 58	2 19
22	F	Ch. Landseer, R.A., d. '79	4 10	8 1	6 1	9 1	2 40	3 1
23	S	Marq. Hartington b. 1833	4 11	8 0	7 18	9 33	3 24	3 46
24	𝔖	7th Sunday after Trinity	4 13	7 59	8 37	10 2	4 9	4 32
25	M	St. James	4 14	7 57	9 56	10 28	4 55	5 18
26	Tu	St. Anne	4 16	7 56	After	10 54	5 41	6 5
27	W	Atlantic Cable laid 1866	4 17	7 55	0 33	11 21	6 30	6 56
28	Th	Clock fast 6m. 15s.	4 18	7 53	1 49	11 52	7 24	7 52
29	F	Day breaks 1h. 14m.	4 20	7 52	3 2	Morn	8 23	8 57
30	S	Twilight ends 10h. 52m.	4 21	7 50	4 12	0 28	9 34	10 12
31	𝔖	8th Sunday after Trinity	4 23	7 48	5 15	1 8	10 49	11 27

MOON'S PHASES.

Full Moon,	5th day, 8h. 34m. M.	*New Moon,*	20th day, 8h. 50m. A.
Last Quarter,	13th day, 6h. 57m. M.	*First Quarter,*	27th day, 2h. 30m. A.

MORNING AND EVENING STARS.

Mercury, *Evening Star* first part of month; conjunction with Moon, 21st; inferior conjunction with Sun, 29th.

Venus, *Evening Star*; conjunction with Moon, 24th.

Mars, *Morning Star*; conjunction with Moon, 19th.

Jupiter, *Evening Star*; in quadrature with Sun, 20th.

AUGUST—31 DAYS.

D M	D W	MEMORANDA.	SUN.				MOON.				HIGH WATER.			
			RISES.		SETS.		RISES.		SETS.		MORN.		AFTER.	
			H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	M	Bank Holiday	4	24	7	47	6	10	1	55	—		0	0
2	TU	Clock fast 6m. 2s.	4	26	7	45	6	56	2	50	0	30	0	58
3	W	Mungo Ponton d. 1880	4	27	7	44	7	35	3	50	1	23	1	48
4	TH	Day breaks 1h. 41m.	4	29	7	42	8	8	4	54	2	9	2	29
5	F	Transfiguration	4	30	7	40	8	35	5	59	2	49	3	7
6	S	Duke Edinburgh b. 1844	4	32	7	38	8	58	7	5	3	24	3	42
7	S	9th SUNDAY AFTER TRINITY	4	33	7	36	9	20	8	10	4	0	4	17
8	M	Transvaal ceded to Boers	4	35	7	35	9	41	9	14	4	35	4	51
9	TU	Twilight e. 10h. 10m. ['80	4	36	7	33	10	2	10	18	5	6	5	22
10	W	Royal Observ. fnd. 1675	4	38	7	31	10	24	After		5	40	5	57
11	TH	Half-quarter Day	4	40	7	29	10	48	0	25	6	16	6	37
12	F	Trin. Law Sit. end	4	41	7	27	11	17	1	29	6	58	7	21
13	S	Stokes (Opt.) b. 1819	4	43	7	26	11	52	2	33	7	47	8	17
14	S	10th SUNDAY AFT. TRINITY	4	44	7	24	Morn		3	35	8	51	9	29
15	M	Walter Scott b. 1771	4	46	7	22	0	34	4	35	10	8	10	46
16	TU	Mars rises 1h. 53m.	4	48	7	20	1	25	5	30	11	23	11	56
17	W	Inner sat. of Mars disc. '77	4	49	7	18	2	26	6	17	—		0	25
18	TH	Day breaks 2h. 29m.	4	51	7	16	3	37	6	57	0	51	1	16
19	F	J. Tyndall b. 1820	4	52	7	14	4	55	7	31	1	40	2	2
20	S	Blackcock shooting beg.	4	54	7	12	6	15	8	1	2	24	2	45
21	S	11th SUNDAY AFT. TRINITY	4	55	7	9	7	36	8	30	3	8	3	29
22	M	Gt. Fire at Bordeaux 1879	4	57	7	7	8	58	8	57	3	51	4	14
23	TU	Twilight ends 9h. 22m.	4	59	7	5	10	19	9	25	4	37	4	58
24	W	St. Bartholomew	5	0	7	3	After		9	55	5	20	5	43
25	TH	M. Faraday d. 1867	5	2	7	1	0	52	10	28	6	6	6	31
26	F	P. Pretsch d. 1873	5	3	6	59	2	4	11	7	6	56	7	24
27	S	Sir Rowland Hill d. 1879	5	5	6	57	3	9	11	53	7	55	8	29
28	S	12th SUNDAY AFT. TRINITY	5	7	6	55	4	6	Morn		9	8	9	51
29	M	Cetewayo capt. (28) 1879	5	8	6	52	4	55	0	45	10	33	11	12
30	TU	Sir J. Ross d. 1688	5	10	6	50	5	35	1	43	11	49	—	
31	W	Helmholtz b. 1821	5	11	6	48	6	9	2	45	0	21	0	47

MOON'S PHASES.

Full Moon,	3rd day, 8h. 40m. A.	*New Moon,*	19th day, 5h. 39m. M.
Last Quarter,	11th day, 11h. 37m. A.	*First Quarter,*	25th day, 8h. 21m. A.

MORNING AND EVENING STARS.

Mercury, *Morning Star* ; stationary, 8th ; greatest westerly elongation, 16th ; conjunction with Moon, 17th.

Venus, *Evening Star* ; greatest brilliancy, 16th.

Mars, *Morning Star* ; conjunction with Moon, 17th.

Jupiter, *Evening Star.*

SEPTEMBER—30 DAYS.

D M	D W	MEMORANDA.	SUN.				MOON.				HIGH WATER.			
			RISES.		SETS.		RISES.		SETS.		MORN.		AFTER.	
			H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	TH	Partridge shooting com.	5	13	6	46	6	38	3	50	1	12	1	34
2	F	Gt. Fire of Lond. 1666	5	15	6	44	7	3	4	55	1	55	2	13
3	S	Oliver Cromwell d. 1658	5	16	6	41	7	25	5	59	2	29	2	46
4	𝔖	13th SUNDAY AFT. TRINITY	5	18	6	39	7	46	7	3	3	2	3	17
5	M	French Republic dec. '70	5	19	6	37	8	6	8	6	3	32	3	48
6	TU	Day breaks 3h. 18m.	5	21	6	35	8	28	9	10	4	5	4	21
7	W	Q. Elizabeth b. 1533	5	23	6	32	8	51	10	13	4	35	4	51
8	TH	Capture of Sebastopol	5	24	6	30	9	17	After		5	6	5	20
9	F	Galvani b. 1737	5	26	6	28	9	48	0	20	5	37	5	56
10	S	*Photographic News* fnd. '58	5	27	6	26	10	26	1	22	6	17	6	39
11	𝔖	14th SUNDAY AFT. TRINITY	5	29	6	23	11	12	2	22	7	4	7	32
12	M	Columbus disc. Am. 1492	5	31	6	21	Morn		3	17	8	4	8	42
13	TU	Salmon Fish. in Scot. e.	5	32	6	19	0	7	4	6	9	27	10	11
14	W	Humboldt b. 1769	5	34	6	16	1	12	4	49	10	51	11	28
15	TH	Mars rises 1h. 42m. m.	5	35	6	14	2	25	5	26	—		0	1
16	F	[Talbot d. 1877	5	37	6	12	3	44	5	58	0	29	0	54
17	S	F. Haugk d. 1881. Fox	5	39	6	10	5	7	6	27	1	18	1	42
18	𝔖	15th SUN. AFT. TRINITY	5	40	6	7	6	30	6	55	2	3	2	24
19	M	Battle of Poictiers 1356	5	42	6	5	7	54	7	24	2	46	3	7
20	TU	Battle of Alma 1354	5	43	6	3	9	16	7	54	3	30	3	52
21	W	Ember Week	5	45	6	0	10	36	8	27	4	14	4	36
22	TH	Venus rises 6h. 6m. morn.	5	47	5	58	After		9	5	4	57	5	19
23	F	Neptune discov. 1846 ['64	5	48	5	56	1	2	9	49	5	42	6	5
24	S	Woodbury's Photo.-Relief	5	50	5	53	2	3	10	40	6	30	6	58
25	𝔖	16th SUNDAY AFT. TRINITY	5	51	5	51	2	55	11	37	7	28	8	4
26	M	Relief of Lucknow 1857	5	53	5	49	3	37	Morn		8	44	9	29
27	TU	Twilight ends 7h. 42m.	5	55	5	46	4	12	0	38	10	13	10	54
28	W	H. Negretti d. 1879	5	56	5	44	4	41	1	42	11	30	—	
29	TH	Michaelmas Day [1874	5	58	5	42	5	7	2	46	0	3	0	31
30	F	Fiji Islands ceded to Eng.	6	0	5	40	5	30	3	50	0	53	1	12

MOON'S PHASES.

Full Moon,	2nd day, 11h. 13m. M.	*New Moon,*	17th day, 2h. 0m. A.
Last Quarter,	10th day, 3h. 3m. A.	*First Quarter,*	24th day, 5h. 4m. M.

MORNING AND EVENING STARS.

Mercury, *Morning Star* first part of month; superior conjunction with Sun 10th; conjunction with Moon, 17th.

Venus, *Morning Star* about end of month; conjunction with Moon, 17th; inferior conjunction with Sun, 21st.

Mars, *Morning Star*; conjunction with Moon, 14th.

Jupiter, *Evening Star*; conjunction with Moon, 20th.

OCTOBER—31 DAYS.

D M	D W	MEMORANDA.	Sun.				Moon.				High Water.			
			Rises.		Sets.		Rises.		Sets.		Morn.		After.	
			H.	M.	H.	M.	H.	M.	H.	M.	H.	M	H.	M.
1	S	Pheasant shooting begins	6	1	5	37	5	51	4	54	1	32	1	50
2	𝔖	17th Sunday aft. Trinity	6	3	5	35	6	11	5	58	2	5	2	20
3	M	Saturn rises 11h. 49m. a.	6	5	5	33	6	33	7	2	2	35	2	49
4	Tu	Day breaks 4h. 13m.	6	6	5	31	6	55	8	5	3	3	3	18
5	W	Twilight ends 7h. 22m.	6	8	5	28	7	20	9	9	3	33	3	49
6	Th	Dividends payable	6	10	5	26	7	49	10	12	4	4	4	20
7	F	Jupiter sets 6h. 17m. a.	6	11	5	24	8	24	After		4	35	4	50
8	S	Gt. Fire at Chicago 1871	6	13	5	22	9	5	0	14	5	6	5	23
9	𝔖	18th Sunday aft. Trinity	6	15	5	19	9	55	1	9	5	43	6	6
10	M	Oxford Mich. Term beg.	6	16	5	17	10	54	1	59	6	32	7	0
11	Tu	Old Michaelmas Day	6	18	5	15	Morn		2	44	7	33	8	10
12	W	[Least twilight	6	20	5	13	0	2	3	22	8	53	9	40
13	Th	Trans. King Edw. Conf.	6	21	5	11	1	16	3	55	10	23	11	0
14	F	Fire Insurance expires	6	23	5	8	2	35	4	25	11	36	—	
15	S	Kaulbach b. 1805	6	25	5	6	3	57	4	53	0	5	0	30
16	𝔖	19th Sunday aft. Trinity	6	26	5	4	5	21	5	20	0	53	1	16
17	M	Reaumur d. 1757	6	28	5	2	6	45	5	49	1	38	1	59
18	Tu	St. Luke	6	30	5	0	8	9	6	21	2	22	2	44
19	W	Sir C. Wheatstone d. 1875	6	32	4	58	9	31	6	58	3	6	3	27
20	Th	Battle of Navarino 1827	6	33	4	56	10	46	7	41	3	50	4	12
21	F	Battle of Trafalgar 1805	6	35	4	54	After		8	30	4	34	4	57
22	S	Franz Lizst b. 1809	6	37	4	52	0	51	9	26	5	19	5	43
23	𝔖	20th Sunday aft. Trinity	6	39	4	50	1	38	10	27	6	8	6	35
24	M	Mich. Law Sittings beg.	6	40	4	48	2	16	11	31	7	5	7	39
25	Tu	Battle of Agincourt 1415	6	42	4	46	2	47	Morn		8	16	8	58
26	W	Hogarth d. 1764	6	44	4	44	3	13	0	36	9	43	10	23
27	Th	Earl of Iddesleigh b. 1818	6	46	4	42	3	36	1	41	10	59	11	32
28	F	St. Simon & St. Jude	6	47	4	40	3	57	2	46	—		0	0
29	S	Hare hunting begins	6	49	4	38	4	18	3	50	0	23	0	44
30	𝔖	21st Sunday aft. Trinity	6	51	4	36	4	38	4	54	1	3	1	21
31	M	All Hallows' Eve	6	53	4	34	4	59	5	57	1	36	1	52

MOON'S PHASES.

Full Moon, 2nd day, 3h. 47m. M. *New Moon,* 16th day, 10h. 35m. A.
Last Quarter, 10th day, 4h. 57m. M. *First Quarter,* 23rd day, 5h. 46m. A.
Full Moon, 31st day, 9h. 31m. A.

MORNING AND EVENING STARS.

Mercury, *Evening Star* ; conjunction with Jupiter, 14th, and with Moon, 13th.
Venus, *Morning Star* ; at greatest brilliancy, 28th.
Mars, *Morning Star* ; conjunction with Moon, 13th.
Jupiter, *Evening Star* ; conjunction with Moon on 18th.

NOVEMBER—30 DAYS.

D M	D W	MEMORANDA.	SUN.				MOON.				HIGH WATER.			
			RISES.		SETS.		RISES.		SETS.		MORN.		AFTER.	
			H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	Tu	All Saints	6	55	4	32	5	23	7	1	2	7	2	22
2	W	All Souls	6	56	4	30	5	51	8	5	2	36	2	50
3	Th	Twilight ends 6h. 24m.	6	58	4	29	6	24	9	9	3	7	3	22
4	F	Clock slow 16m. 19s.	7	0	4	27	7	3	10	10	3	38	3	54
5	S	Gunpowder Plot 1605	7	2	4	25	7	49	11	7	4	11	4	27
6	𝔖	22nd Sunday aft. Trinity	7	4	4	23	8	44	After		4	44	5	2
7	M	Mercury stationary	7	5	4	22	9	47	0	44	5	23	5	47
8	Tu	Saturn rises 9h. 36m. a.	7	7	4	20	10	57	1	22	6	12	6	40
9	W	Pr. of Wales b. '41. Lord	7	9	4	18	Morn		1	55	7	12	7	47
10	Th	[Mayor's Day	7	11	4	17	0	12	2	25	8	26	9	9
11	F	Half-quarter Day	7	12	4	15	1	30	2	53	9	52	10	29
12	S	Bank Charter Act sus. '57	7	14	4	14	2	50	3	19	11	4	11	37
13	𝔖	23rd Sunday aft. Trinity	7	16	4	12	4	12	3	46	—		0	3
14	M	Mozart b. 1719	7	18	4	11	5	36	4	15	0	27	0	50
15	Tu	St. Machutus	7	19	4	10	6	59	4	48	1	13	1	37
16	W	Mars rises 1h. 9m. morn.	7	21	4	8	8	20	5	28	2	0	2	24
17	Th	St. Hugh	7	23	4	7	9	35	6	16	2	47	3	9
18	F	Sir D. Wilkie b. 1785	7	25	4	6	10	39	7	11	3	31	3	54
19	S	Thorwaldsen b. 1770	7	26	4	4	After		8	12	4	16	4	39
20	𝔖	24th Sunday aft. Trinity	7	28	4	3	0	15	9	17	5	0	5	22
21	M	Princess Royal b. 1840	7	30	4	2	0	50	10	24	5	47	6	13
22	Tu	St. Cecilia	7	31	4	1	1	18	11	30	6	40	7	9
23	W	St. Clement	7	33	4	0	1	42	Morn		7	40	8	13
24	Th	Venus rises 3h. 6m. morn.	7	34	3	59	2	3	0	35	8	49	9	29
25	F	St. Catherine	7	36	3	58	2	24	1	39	10	6	10	40
26	S	Prs. Maud of Wales b. '69	7	38	3	57	2	44	2	42	11	11	11	39
27	𝔖	1st Sunday in Advent	7	39	3	56	3	5	3	46	—		0	3
28	M	*Times* prtd. by steam 1814	7	41	3	55	3	27	4	50	0	25	0	44
29	Tu	F. W. Window d. 1875	7	42	3	54	3	53	5	55	1	2	1	21
30	W	St. Andrew's Day.	7	44	3	53	4	24	7	0	1	38	1	55

MOON'S PHASES.

Last Quarter,	8th day, 5h. 2m. A.	*First Quarter,*	22nd day, 10h. 43m. M.
New Moon,	15th day, 8h. 8m. M.	*Full Moon,*	30th day, 3h. 20m. A.

MORNING AND EVENING STARS.

Mercury, *Evening Star* first part of month ; stationary, 7th ; conjunction with Moon, 15th ; inferior conjunction with Sun, 17th ; stationary, 26th.

Venus, *Morning Star* ; conjunction with Moon, 12th.

Mars, *Morning Star* ; conjunction with Moon, 10th.

Jupiter, *Morning Star* from middle of month ; conjunction with Moon, 14th.

DECEMBER—31 DAYS.

D M	D W	MEMORANDA.	SUN.				MOON.				HIGH WATER.			
			RISES.		SETS.		RISES.		SETS.		MORN		AFTER.	
			H.	M.	H.	M.	H.	M.	H.	M	H.	M.	H.	M.
1	TH	Princess of Wales b. '44	7	45	3	53	5	1	8	3	2	11	2	28
2	F	Coup d'Etat in Paris '51	7	47	3	52	5	45	9	2	2	44	3	0
3	S	Archbp. A. C. Tait d. '82	7	48	3	52	6	38	9	57	3	18	3	37
4	𝔖	2nd SUNDAY IN ADVENT	7	49	3	51	7	39	10	45	3	54	4	13
5	M	Twilight ends 5h. 55m.	7	51	3	51	8	46	After		4	32	4	52
6	TU	St. Nicholas	7	52	3	50	9	58	0	1	5	12	5	36
7	W	Jupiter rises 5h. 48m. m.	7	53	3	50	11	14	0	30	6	2	6	28
8	TH	Con. B. V. M.	7	54	3	50	Morn		0	57	6	58	7	29
9	F	Transit of Venus 1874	7	55	3	49	0	31	1	22	8	2	8	38
10	S	Capture of Plevna 1877	7	57	3	49	1	49	1	46	9	16	9	53
11	𝔖	3rd SUNDAY IN ADVENT	7	58	3	49	3	9	2	13	10	28	11	0
12	M	Mars rises 0h. 46m. morn	7	59	3	49	4	31	2	44	11	32	—	
13	TU	Dr. S. Johnson d. 1784	8	0	3	49	5	52	3	19	0	1	0	27
14	W	Ember Week. Pr. Consort	8	1	3	49	7	9	4	1	0	53	1	12
15	TH	[d. 1861	8	1	3	49	8	19	4	53	1	44	2	8
16	F	Thos. Ross d. 1870	8	2	3	49	9	19	5	52	2	32	2	55
17	S	Davy b. 1778	8	3	3	50	10	8	6	57	3	18	3	41
18	𝔖	4th SUNDAY IN ADVENT	8	4	3	50	10	47	8	5	4	2	4	25
19	M	Camb. Mich. Term ends	8	5	3	50	11	20	9	13	4	46	5	7
20	TU	[Sittings end	8	5	3	51	After		10	20	5	28	5	49
21	W	Shortest Day. Mich. Law	8	6	3	51	0	9	11	25	6	13	6	37
22	TH	Wollaston d. 1828	8	6	3	52	0	30	Morn		7	1	7	26
23	F	Lord Romilly d. 1874	8	7	3	52	0	50	0	30	7	53	8	24
24	S	W. M. Thackeray d. 1863	8	7	3	53	1	10	1	34	8	55	9	29
25	𝔖	CHRISTMAS DAY	8	7	3	53	1	32	2	37	10	4	10	36
26	M	Bank Holiday	8	8	3	54	1	55	3	42	11	7	11	36
27	TU	St. John	8	8	3	54	2	23	4	46	—		0	3
28	W	Innocents' Day	8	8	3	55	2	58	5	50	0	25	0	47
29	TH	W. E. Gladstone b. 1809	8	8	3	56	3	40	6	53	1	9	1	28
30	F	John Wycliff d. 1384	8	8	3	57	4	30	7	51	1	48	2	7
31	S	New Year's Eve	8	8	3	58	5	29	8	42	2	26	2	45

MOON'S PHASES.

Last Quarter,	8th day, 3h. 11m. M.	*First Quarter,*	22nd day, 7h. 1m. M.
New Moon,	14th day, 7h. 22m. A.	*Full Moon,*	30th day, 8h. 14m. M.

MORNING AND EVENING STARS.

Mercury, *Morning Star*; conjunction with Jupiter, 4th; conjunction with Moon, 13th.

Venus, *Morning Star*; greatest westerly elongation, 2nd; conjunction with Moon, 11th; in perihelion, 12th.

Mars, *Morning Star*; conjunction with Moon, 9th; in perihelion, 26th.

Jupiter, *Morning Star.*

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Ordinary meetings at the Gallery of the Society of Painters in Water Colours, 5A, Pall Mall East, at 8 p.m., the second Tuesday of each month from November to June inclusive. Monthly Technical meetings the fourth Tuesday of every month during the year at 8 p.m. Annual Meeting February.

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The Ordinary Meetings are held monthly, from November to May. Annual Meeting on the second Thursday in November.

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The Ordinary Meetings are held in the Professional Hall, 20, George Street, on the first Wednesday of each month, except July, August, and September, at 8 o'clock, p.m. Annual Meeting first Wednesday in November.

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Meetings at 36, George Street, at 6.30 p.m., second Thursday from Sept. to May inclusive. Lantern Meeting, fourth Wednesday from Sept. to March inclusive. Annual Meeting October. Out-Door Meetings, fortnightly during the summer months.

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The ordinary Meetings are held in the Philosophical Society's Rooms, 207, Bath Street, at 8 p.m., every alternate Thursday from September to April. Annual Meeting, April.

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Meetings in College of Physical Science, second Tuesday in Jan., Feb., March, April, May, Oct., Nov., and Dec. at 7.30 p.m. Annual meeting in Jan.

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The Ordinary Meetings are held at the Free Public Library and Museum, William Brown Street, at 6 p.m., on the last Thursday in each month, with the exception of December. Annual Meeting last Thursday in November.

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Meetings at the Lamb Hotel, Dundee, first Thursday of each month, from October to May inclusive. Annual Meeting in May.

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Meetings at the "Queen's" Hotel, Queen's Road, at 7·30 p.m., on the third Wednesday in each month. Annual Meeting, January.

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The Ordinary Meetings are held at the "Lyceum" last Thursday in each month at 8 p.m. Annual meeting last Thursday October.

YORKSHIRE COLLEGE PHOTOGRAPHIC CLUB.

Secretary and Treasurer—H. B. Hall, 89. Caledonian Road, Leeds.

The Ordinary Meetings are held at the College Buildings on the first Friday in every month during the College Session, at 7.30. Annual Meeting in June.

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The Ordinary Meetings are held at "The Baths," at 8 p.m., on the first Thursday of each month. Annual Meeting first Thursday in October.

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The Meetings are held at the Grammar School, the second Thursday in the month at 7.30. The Annual Meeting second Thursday in October.

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Ordinary Meetings held at the Temperance Hall, at 8 p.m., third Wednesday in each month. Annual Meeting third Wednesday in October.

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The Meetings take place at 7.30 p.m. on the second Thursday in each month.

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Meetings at Mechanics' Institute, Hanley, first Wednesday in each month. Annual Meeting in November.

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Meetings every Wednesday evening at Anderton's Hotel, Fleet Street.

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The Club is limited to thirty members, and Meetings are held on third Wednesday of each month, at 5, St. Andrew Square. Annual Meeting in November.

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Meetings are held in the Rooms of the Association, 180, West Regent Street, Glasgow, on third Tuesday in each month. Informal meetings every Tuesday 7.30 p.m. Annual Meeting in December. Dark room at disposal of visitors.

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Meetings held on the second Tuesday in each month at the Masonic Hall, Cooper Street. Annual Meeting last Tuesday in January.

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The Club is governed by the Officers and a Council of fourteen Members.

Meetings: Winter Session.—Every second Thursday Evening in each month from October to May inclusive, in the Mechanics Hall, at 7·30. Summer Session June to September.—Outdoor trips monthly, second Thursday in each month, and the Annual Excursion on Midsummer day.

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Custodian of Apparatus—E. Purton.

Meets first Monday in each month, at the Royal Society's Hall, Melbourne.

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Meetings held at "Museum," College Square North, Belfast, on second Monday in each month, from October to April inclusive, at 7.30 p.m. Annual Meeting in January.

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Meetings are held on the last Wednesday in each month, except December.

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Ordinary Meetings are held at Myddleton Hall, Upper Street, Islington, N., on first and third Tuesdays in month. Out-door meetings on Saturday afternoons during summer months. Exhibition in January, and Annual Meeting third Tuesday in January.

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Meetings held on the first Tuesday of each month.

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Committee—G. L. Salt, R. M. Meyer.

SUTTON SCIENTIFIC SOCIETY.

PHOTOGRAPHIC SUB-COMMITTEE.

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Meetings are held at the Rooms of the Society, 18, High Street, Sutton, Surrey, on first Tuesday in every month at 8 p.m.

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Ordinary Meetings held on the 15th of each month.

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Committee—The Officers, and Messrs. Carson, Mayall, Walker, and Hill.

General Meetings are held at the Mission Schools, Seacombe, at 8 p.m. on the Wednesday of each month, and an Informal Meeting weekly. Annual Meeting first first Wednesday in November.

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Joint Hon. Secretaries—B. Karleese and J. H. Pickard, Technical Schools, Bridge Street, Birmingham.
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Meetings at the Technical School, Bridge Street, Birmingham, at 7·30 p.m. on the second and fourth Thursday of each month, excepting April, May, June, July, August, and September, when they are held on the fourth Thursday only. Annual Meeting, the fourth Thursday in November.

CARDIFF AMATEUR PHOTOGRAPHIC SOCIETY.

President—Samuel Wesley Allen, M.I.M.E.
Vice-Presidents—Alexander Kellar and H. Dyer.
Treasurer—W. H. D. Mewton. *Hon. Sec.*—G. H. Bedford, 127, Bute Road.
Council—Edwin Seward, A.R.I.B.A., R.C.A., Samuel Parfitt, W. H. Kitchen, W. Davies, John Neall, W. Furley, E. Lewis, E. Barry, C. R. Scott, P. H. Hacquoil, John Weaver, T. R. W. Williamson.

Informal Meetings held in the Rooms, Working Street, each Wednesday evening. Monthly Meeting second Friday in each month. Annual Meeting, November.

HALIFAX PHOTOGRAPHIC SOCIETY.

President—F. H. Bowman, D.Sc., F.R.S.E., &c.
Vice-Presidents—E. Gledhill and John R. Farrar.
Committee—S. Worsnip, W. Ward, T. H. K. Leer, and M. Mauley.
Hon. Sec.—Luther Hanson, 36, North Parade. *Treasurer*—J. J. Learoyd.

Meetings are held on the first Friday in every month, at M. Mauley's, Barum Top, Halifax, at 8 p.m. Annual Meeting third Friday in October.

AMATEUR PHOTOGRAPHIC ASSOCIATION.

President—H.R.H. the Prince of Wales.

Council—The Archbishop of York; Marquis of Drogheda; Lord de Ros; Earl of Rosse, F.R.S.; C. Stephens, M.A. (Oxon); A. Farre, M.D., F.R.S., &c.; James Glaisher, F.R.S., F.R.A.S., &c.; George Shadbolt; W. D. Howard, F.I.C.; Capt. J. C. A. Lewis, M.A. (Cantab.); Walter Wood, F.R.H.S.; and W. S. Hobson.

Referees—James Glaisher, F.R.S., F.R.A.S., &c.; and W. D. Howard, F.I.C.

Hon. Sec.—A. J. Melhuish, F.R.A.S., F.R.M.S., York House, York Place, W.

Executive Artist—Alexander Bassano, 25, Old Bond Street, W.

Object—Printing and Interchange of the productions of Amateurs.

HYDE AMATEUR PHOTOGRAPHIC SOCIETY.

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Secretary—John Pennington, Gt. Norbury Street, Hyde.

Treasurer—George Batty.

Council—J. T. Cartwright, J. M. Chorton, Ed. McClean, Herbert Stafford.

Meetings every alternate Wednesday, at 8 p.m., in the Mechanics' Institution.

POSTAL PHOTOGRAPHICAL SOCIETY.

Hon. Secretary—W. M. Baylis, 4, Middle Temple Lane, E.C.

Founded for the convenience of Amateurs in circulating prints, negatives, &c., and exchanging photographs and photographic information through the medium of the Parcels and Book Post.

LEEDS PHOTOGRAPHIC SOCIETY.

President—Dr. Thorpe, F.R.S. *Vice-President*—J. W. Ramsden.

Treasurer—B. Reffit.

Hon. Sec.—T. W. Thornton, 22, Carr Road.

Committee—Messrs. Bedford, Branson, Denham, Rodwell, Teasdale, Warburton.

Meets first Thursday in each month at the Philosophical Hall, at 8 o'clock. Annual Meeting, December.

PHOTOGRAPHIC SOCIETY OF IRELAND.

President—Dr. J. Emerson Reynolds, F.R.S.

Vice-President—Howard Grubb, F.R.S. *Treasurer*—Thomas A. Bewley.

Council—Herbert Bewley, George Mansfield, J.P., Professor Hartley, F.R.S., E. P. Johnson, Greenwood Pim, John L. Robinson, Thos. Mayne, M.P., John V. Robinson, Dr. Scott, and Joseph H. Woodworth.

Joint Hon. Secretaries—Alexander Conan, 1, Carlton Villas, Shelbourne Road, Dublin, and E. P. Johnson, 30, Upper Mount Street.

Meetings at Royal College of Science, Dublin, at 8 p.m second Friday during January, February, March, April, May, October, November, December. Annual meeting, November.

SHEFFIELD PHOTOGRAPHIC SOCIETY.

President—W. B. Hatfield. *Vice-Pres.*—Dr. Morton and Councillor T. Firth.

Treasurer—T. S. Yeomans. *Secretary*—J. Taylor, Holland Place, London Road.

Council—W. H. Bacon, J. Turner, E. H. Pearce, A. S. Platts, and the Officers.

Meetings at the Masonic Hall, first Tuesday in the month, at 7.30. Annual Meeting in October.

OXFORD UNIVERSITY PHOTOGRAPHIC CLUB.

President—G. S. Edwards, Crick Road.

Committee.—E. W. H. Fyers (Ch. Ch.), A. A. Jackson (Magdalen), J. B. Allan (Oriel). *Hon. Sec. and Treas.*—J. D. Ackland, (Ch. Ch.)

Meetings are held at least three times a term in members' rooms.

THE HULL AMATEUR PHOTOGRAPHIC SOCIETY.

President—A. K. Rollit, LL.D., D.C.L.

Vice-President—J. Campbell Thompson. *Treasurer*—Douglas G. Joy.

Council—C. F. Amos, A. S. Ayre, S. B. Mason, David Sissons, H. W. Ringrose Smith, and W. E. Woolf.

Librarian—M. B. Stoakes, Whitefriargate, Hull.

Hon. Secs.—G. L. Shackles and E. H. Howlett, 7, Land of Green Ginger, Hull.

The Ordinary Meetings are held on the last Saturday in each summer month, May to October inclusive; and on the last Thursday in each winter month except December. The Annual Meeting is held on the last Thursday in November.

Scientific Societies and Institutions.

BRITISH ASSOCIATION, 22, Albemarle Street.

President—Sir W. Dawson, K.C.M.G.

General Secretaries—Captain Douglas Galton, C.B., F.R.S., and A. G. Vernon Harcourt, F.R.S. *Secretary*—A. T. Atchison, M.A.

Gen. Treas.—Prof. A. W. Williamson, F.R.S. *Clerk*—H. C. Stewardson.

CHEMICAL SOCIETY, Burlington House.

President—H. Muller, Ph.D., F.R.S.

Hon. Secretaries—J. M. Thomson, F.R.S.E., and H. E. Armstrong, Ph.D., F.R.S.

KEW OBSERVATORY, Old Deer Park, Richmond.

Superintendent—G. M. Whipple, B.Sc., F.R.A.S.

Chief Assistant—T. W. Baker, F.M.S.

ROYAL ASTRONOMICAL SOCIETY, Burlington House.

President—J. W. L. Glaisher, F.R.S.

Secretaries—E. B. Knobel and Lt.-Col. G. L. Tupman, R.M.A.

Foreign Secretary—W. Huggins, LL.D., F.R.S. *Assist. Sec.*—W. H. Wesley.

ROYAL MICROSCOPICAL SOCIETY, King's College, Strand.

Secs.—Frank Crisp, B.A., and F. Jeffrey Bell. *Assistant Sec.*—James West.

SOCIETY OF BRITISH ARTISTS, Suffolk Street.

Secretary—H. H. Canty. *Acting Secretary*—A. F. Le Patourel.

ROYAL SOCIETY, Burlington House.

Pres.—Prof. G. G. Stokes, D.C.L. *V.-P. and Treas.*—J. Evans, D.C.L.

Secretaries—Prof. Michael Foster, M.D., and Lord Rayleigh, D.C.L.

Foreign Secretary—Prof. A. W. Williamson, LL.D.

Assistant Sec. and Librarian—Herbert Rix, B.A. *Clerk*—T. James.

SOCIETY OF ARTS, John Street, Adelphi.

Sec.—H. Trueman Wood, M.A. *Assistant Sec.*—H. B. Wheatley, F.S.A.

Foreign Photographic Societies.

AUSTRALIA.—Amateur Association of Victoria, &c.—*Pres.*: Dr. Browning.

NEW ZEALAND.—Wellington Amateur Photographic Society—*President*: Dr. Hutchinson; *Secretary*—W. Williams. Auckland Photographic Society—*President*—J. M. Clarke; *Vice-Presidents*—W. J. Hurst, M.H.R., and John Chambers; *Secretary*—J. H. Sinclair; *Treasurer*—Clement Bartley.

FRANCE.—Société Française de Photographie (Paris)—*President*: M. Péligot. Société Photographique de Toulouse—*President*: M. Sipierre. Chambre Syndicale de la Photographie (Paris)—*President*: T. Lévy. Société Nantoise de Photographie (Nantes)—*President*: M. Bascher. Société Photographique du Sud-Ouest, Angoulême—*President*: Count Laurencie; *Secretary*: Mr. F. Braun. Société Versaillaise de Photographie—*President*: M. de Sivry.

BELGIUM.—Association Belge de Photographie (Brussels)—*President*: A. de Blochouse. Mutuelle Photographique Belge (Brussels)—*Pres.*: M. Delabarre.

HOLLAND.—Amsterdamsche Photographen Vereenigung—*Pres.*: M. Haakman.

DENMARK.—Dansk Fotografisk Forening—*President*: J. Petersen.

SWITZERLAND.—Schweizer Photographen Gehilfen Verein (Zurich)—*President*: G. Stephany. Geneva Photographic Society—*President*: Dr. H. Fol. Schweizerischen Photographen Fachverein (Bern)—*President*: C. Vollemeister.

NORWAY.—Photographischer Verein (Christiania)—*President*: H. Abel. Fotographiske Selskab—*President*: M. L. Szacinski.

AUSTRIA.—Photographische Gesellschaft (in Wien)—*Pres.*: O. Volkmer. Verein Photographischer Mitarbeiter (in Wien)—*Pres.*: H. Lenhard. Selbstbildungs und Unterstützungs Verein der Photographischen Mitarbeiter in Buda-Pest—*President*: F. Kozmata.

GERMANY.—Verein zur Förderung der Photographie in Berlin—*Pres.*: Dr. H. Vogel. Photographischer Verein zu Berlin—*Pres.*: Dr. F. Stolze. Verein der Photographen Gehilfen zu Berlin—*President*: P. Meyer. Photographische Gesellschaft zu Hamburg (Altona)—*Pres.*: G. Wolf. Verein zur Pflege der Photographie und verwandter Künste in Frankfurt—*Pres.*: W. Hetzer. Photographischer Verein zu Bremen—*Sec.*: J. Herzog. Rheinisch-Westphälischer Verein zur Pflege der Photographie und verwandter Künste zu Köln—*Pres.*: Th. Creifelds. Deutscher Photographen-Verein (Weimar)—*Pres.*: K. Schwier. Internationaler Photographen Verein, Victoria, at Guben—*Pres.*: J. Pfeiffer. Kasseler Photographen-Verein—*Pres.*: Prof. Roux. Photographen Verein zu Nürnberg—*Pres.*: J. C. Schmidt, Jun. Münchener Photographische Gesellschaft—*Pres.*: F. Werner. Schleswig-Holsteinischer Photographen-Verein (Flensburg)—*Pres.*: J. Koch. Photographen-Gehilfen-Verein zu Dresden—*President*: James Aurig.

RUSSIA.—Russian Photo. Society (St. Petersburg)—*Pres.*: M. L. Levitsky.

AMERICA.—Photographers' Association of America—*Pres.*: W. H. Potter. Photographic Section of American Inst. (N.Y.)—*Pres.*: H. J. Newton. Society of Amateur Photographers of New York—*President*: F. C. Beach. Boston Photographic Association—*President*: E. Foss. German Photographic Society (N.Y.)—*Pres.*: Theo. Gubelman. Brooklyn Photographic Art Association (N.Y.)—*Pres.*: G. F. Van Doren. Maryland Photographic Association (Baltimore)—*Pres.*: E. Busey. Photographic Society of Philadelphia—*Pres.*: J. W. Bates. Photographic Association of the District of Columbia (Washington)—*President*: E. J. Pullmann. Pensylvania Photographic Association (Philadelphia)—*Pres.*: J. C. Keinmann. New Orleans Photographic Association—*President*: ——. Louisville Photographic Society—*President*: Mr. Klauber. Chicago Photographic Association—*Pres.*: F. H. Davies. Indianapolis Photographic Association—*Pres.*: D. O. Adams. Photographic Association of Western Illinois (Galesburg)—*Pres.*: S. T. Bryan. Buffalo Photographic Association—*Pres.*: J. Samo. Photographic Art Society of the

Pacific (SanFrancisco)—*Pres.*: J. Shew. Association of Operative Photographers (New York)—*Pres.*: C. Schaidner. Photographic Society of Boston—*Pres.*: W. Parkinson. Rochester (New York) Photographic Association—*Pres.*: J. M. Trop; *Secretary*: W. D. Lee. St. Louis Photographic Association—*President*: Gustave Cramer. Detroit Photographic Association—*President*: Jex. Bardwell. Brooklyn Amateur Photographic Club—*President*: Lewis Atkinson. Boston Society of Amateur Photographers—*President*: E. F. Wilder. Chicago Amateur Club—*President*: Dr. H. D. Garrison. The "Argents," Washington, D.C.—*Secretary*: S. L. Philips. Pittsburg Amateur Club—*President*: A. S. Murray; *Secretary*: U. S. Hill.

Foreign Photographic Periodicals.

French.

Bulletin de la Société Française de Photographie, published in Paris. Monthly.
Le Moniteur de la Photographie, published in Paris. Fortnightly.
Revue Photographique, published in Paris. Monthly.
Journal de l'Industrie Photographique, published in Paris. Monthly.
Le Progrès Photographique, published in Paris. Monthly.
L'Amateur Photographe, published in Paris. Weekly.
Bulletin de la Societe Versaillaise de Photographie, pub. at Verseilles. Monthly.

German
Photographisches Archiv, published in Düsseldorf. Fortnightly.
Photographische Mittheilungen, published in Berlin. Fortnightly.
Photographisches Wochenblatt, published in Berlin. Weekly.
Deutsche Photographen-Zeitung, published in Weimar. Weekly.

American.

The Philadelphia Photographer, published in Philadelphia. Monthly.
Anthony's Photographic Bulletin, published in New York. Fortnightly.
Photographic Times, published in New York. Weekly.
Walzl's Monthly, published in Baltimore.
The St. Louis Photographer, published in St. Louis. Monthly.
The Photographic Eye, published in Chicago. Weekly.
The Photographic Beacon, published in Chicago. Monthly.

Dutch.

Tidschrift voor Photographie, published in Amsterdam. Monthly.
De Navorscher op het Gebied der Photographie, published in Amsterdam. Monthly.

Belgian.

Bulletin de l'Association Belge de Photographie, published in Brussels. Monthly.

Austrian.

Photographische Correspondenz, published in Vienna. Monthly.
Photographische Notizen, published in Vienna. Monthly.
Der Photographische Mitarbeiter, published in Vienna. Monthly.

Italian—
Rivista Fotografica Universale, published in Brindisi. Monthly.
Camera Oscura, published in Florence. Monthly.

Spanish—*Boletin Fotografico*, published in Havannah. Monthly.
Portuguese—*A Arte Photographica*, published at Oporto. Monthly.

Foreign Year-books.

Photographisches Jahrbuch (Vienna). *Aide Mémoire de Photographie* (Paris).
Annuaire Photographique (Paris). *Agenda de l'Association Belge* (Brussels).
Photographic Mosaics (Philadelphia).
Deutscher Photographen Kalender (Weimar).
Photographischer Almanach und Kalender (Düsseldorf).

Annals of Photography for 1886.

NEW workers during this year have been enabled to start from a far higher plane than those who laboured during any one of the fifty-nine years which have passed since Niepce made his camera picture of the house-tops at Kew. So much is this the case that the intelligent beginner who diligently availed himself of the appliances provided by the labour of others, might reasonably hope, even after a few weeks' work, to see grow under his hands such photographs as would gain praise from old and experienced photographers. Hence we find that the number of amateur photographers has increased enormously, and there has been a corresponding activity among the constructors of photographic apparatus. Dealers in apparatus have not been slow to take advantage of a condition of things in which almost any one may become—at any rate, in appearance—a photographer : and the curious way in which one enterprising firm grasps the spirit of the year is worth putting upon record. This firm publishes as an advertisement what we suppose to be an actual letter, although one might at first sight be inclined to doubt. In the advertisement we find the following : —"Though I had but little leisure for practice, in two months I found myself sufficiently at home to take my camera to Holland, and brought back a couple of dozen pictures without having spoilt one plate. This result cannot be attributed to any special aptitude on my part. It is no doubt due to the goodness of the lens and other apparatus with which you supplied me, and to the excellence of the instruction which is received at your establishment." To this letter is attached the name P. H. Kempthorne, and the address is given as Wellington College.

The increased demand for low-priced photographic apparatus and for plates has, during the past year, tended much to put the manufacture of such goods into the control of a few owners of factories, the goods being then sold to dealers, either with the retailer's name already on, or blank, so that the name of the non-maker can readily be affixed. One consequence of this system is that the old makers of the highest class of cameras and lenses have not experienced a period of activity proportionate to that of the makers of that cheap apparatus which is considered good enough to supply to amateurs commencing.

Still one may look upon the tendency towards change in the mode of production from the small scale to the large scale with some satisfaction, as it gives hope for the time when all ordinary apparatus will be made to standard guage, and when camera backs, camera fronts, and similar things will be interchangeable.

It is, perhaps, in the manufacture of dry plates that the competition —both as regards price and quality—has become most severe, and at the same time the number of actual factories has diminished, although the number of persons advertising themselves as plate-makers may have increased. The prices quoted at the factory, for quantities, have been as low as sixpence per dozen for quarter-plates, still the quality of commercial dry plates has certainly not fallen off; indeed, it is rather the other way, if anything.

The advantages of isochromatic or orthochromatic plates for copying pictures have, during the past year, become thoroughly appreciated; perhaps mainly because some excellent results in the way of picture reproduction were shown in the Photographic Exhibition of this year.

This brings us to say a few words about the Exhibition of the Photographic Society. The general impression seemed to be that far too many photographs were shown. They were piled up almost to the ceiling, and went down to the floor-level, to say nothing of the crowded screens. The number probably served to lower the general average, and not only this, but to weary the visitor. Perhaps if only a fourth or a sixth of the number had been shown, the general impression would have been more favourable; and if such a proportion had been selected with judgment, the standard of the Exhibition would, in all probability, have been far ahead of any one of the previous collections.

Paper negatives, which towards the end of last year seemed likely to make very great headway, are talked of less, but still are used by many. The great trouble with them is the fact that one must either put up with the fact that they print very much more slowly than glass, or else attempt to render them transparent with oily and resinous preparations.

During this year Vergara has introduced a tissue consisting of paper made transparent by means of a sort of resinous varnish, and then coated with emulsion; this material giving negatives which appear as transparent as glass, and which require no treatment of any kind to render them transparent. Progress has also been made by the Eastman Company, who are on the point of introducing a tissue from which the paper can be removed after development; and the actual negative—either stiffened by the addition of a fresh thickness of gelatine, or unstiffened—can be used without any of the disadvantages incidental to paper negatives. Such negatives print equally well from either side, and are of especial value to the carbon printer, the Woodburytypist, or the Collotyper.

Now that the roller slide has come into general use, and is likely to be used still more, there appears to be a revival of the reflecting camera, some forms of which are shown on page 183 and page 184. Recent patents taken out in connection with the subject appear to indicate that the patentees are unaware of what was done long before.

This brings us to the photographic patents of the year, and in looking over them we fail to find one patented invention of so much merit or originality as to be worthy of special mention here, most of them being revivals of old inventions or processes.

W. J. Harrison has carried speculation so far as to point out that light images are flying away from the earth, through space, at the rate of 186,000 miles per second, and that—if certain difficulties could be overcome—all one would have to do to secure a photograph of, let us say, Julius Cæsar landing in Britain, is to place the camera far enough away.

A convention of photographers was held at Derby, and it is intended to hold the Convention annually at some large town in the United Kingdom. The attendance at Derby was not very large—very considerably under a hundred, and indeed nearer fifty—but it may be that in future years a larger proportion of the amateur and professional photographers of the United Kingdom will attend.

Some attention has been given to pinhole photography, or photography without a lens, and an example of a pinhole photograph will be found on p. 160 ; while some progress has been made in lenses, Voigtlander and Co. having introduced a series of rectilinears or symmetricals with an aperture as large as $\frac{f}{4}$. As a paper for printing, albumenized paper still holds the sway, although development paper and printing out papers with collodion or gelatine base have been introduced commercially, and pushed with some energy ; but for enlargements the gelatino-bromide development paper is being very extensively used. It may be noted that partisans have appeared who contend that photographs on such a material are likely to be permanent ; but in the face of this we have our general experience of silver prints.

In connection with the progress of photo-mechanical printing there is little to be said, excepting to record the circumstance that the use of typographic blocks made from original photographs has increased enormously, there being now a very large number of illustrated publications that occasionally use process blocks from original photographs. Almost the whole of these blocks are made with the ruled grain which is characteristic of blocks by the Ives' method, the grain of reticulated gelatine being but rarely seen in block prints. Although it is difficult to gather that there has been any real advance in the average quality of the blocks, the average quality of the impressions has become decidedly higher ; the printer having realised that a long succession of vigorous impressions cannot be obtained when the old-fashioned blanket is used, and that the printing of the photo-blocks requires great care as regards accidental dirt in connection with the inking appliances.

Our inset illustration is an excellent example of animal photography, by C. Reid, and a good example of the Woodburytype printing process, as now carried out by the London Stereoscopic Company. The Photographer writes :—"The behaviour of the mother was very different from that of her family, the latter being full of fun, while the former was reserved and sulky. For a long time it seemed as if we were to be baffled in our efforts to get a picture ; but after a great deal of handling and posing, the object of which our sitters evidently mistook, a moment's quietness was obtained."

Guides to Practice—By Various Contributors.

THE PREPARATION AND USE OF ORTHOCHROMATIC PLATES.

BY DR. J. M. EDER.

By orthochromatic plates, one understands such gelatine plates as have, by being stained with colouring matters, been made sensitive for the spectral rays of lower refrangibility—that is to say, have been made specially sensitive to green, yellow, and red rays.

For this purpose eosine, erythrosine, cyanine, or azaline is employed. It should be noted that eosine only sensitizes for the green and the yellow, while erythrosine is somewhat more useful, especially as regards the orange. Cyanine, although sensitizing for the red, injures the quality more than is the case with erythrosine. Azaline is at the same time an excellent sensitizer for the yellow and the red.

It is generally recognized that orthochromatic plates are useful for photographing paintings, but such plates can also be used with advantage for other purposes. They are excellent for copying old and yellow parchment manuscripts, papyrus, and so forth, and I myself have successfully photographed some Egyptian papyrus documents which had previously been considered as "non-photographable."

Orthochromatic plates have not been much made use of for landscape work, yet is the advantage considerable when bright green meadows or yellowish grainfields are in the foreground; and the foliage, as also the perspective of distant mountains, is certainly rendered more artistically. Still, an essential condition is the use of a yellow glass before the objective, or better still, in the position of the diaphragm. This glass must be accurately ground, and the sides must be truly parallel.

Commercial glass plates are generally very badly ground, and then un-sharpness is the result. In addition, the glass should be thin, or otherwise the focus of the lens is disturbed.

Especially useful are the orthochromatic plates in the photographing of clouds; indeed, as soon as one photographs them through dark yellow glass, they are reproduced with remarkable perfection.

In the case of photo-micrographical reproductions, orthochromatic plates may be of great service. The yellow glass plate can be dispensed with when gas or petroleum light is used, and the plates are coloured with azaline or erythrosine.

I can recommend the following method of preparing isochromatic plates. Ordinary gelatine bromide plates are immersed in the following bath:—

Water	100 parts
Erythrosine solution, 1 part in 500 ...	1 to 2 ,,
Ammonia	½ part

The plates should be allowed to remain in the bath for two minutes, after which they are drained and dried in absolute darkness. Development may be carried on in the usual way, but it is generally advisable to add a little restrainer (bromide of potassium, for example), in order that the plates may be quite clear and free from veil.

Eosine or erythrosine plates become much more sensitive if they are immersed in very dilute silver nitrate.

In this case the eosine or erythrosine compound of silver is formed, and this acts as a chemical sensitizer. Consequently such plates are not only more sensitive generally, but also more specially sensitive to yellow light, a fact which I published in the year 1884. Indeed, such plates can be used without the yellow screen, as Obernetter and H. W. Vogel have pointed out.

It must be remembered that the silver solution must be very much diluted, otherwise fog will appear on development. The best strength is from 0·05 to 0·1 per cent. of silver nitrate in a mixture of equal parts of alcohol and water. The plates dry rapidly, but they only keep in a good condition for a very short time. Some plates only give clear images by this method when oxalate developer is used; and indeed some plates are not adapted for this method of increasing the sensitiveness with nitrate of silver.

ON JUDGING EXPOSURE.

BY CAPT. ABNEY, R.E., F.R.S.

Perhaps one of the hardest things in photography is judging the exposure necessary to give a plate under certain circumstances. It may, perhaps, be thought, from the heading of this article, that I am going to show how to do it; but if such an opinion is formed, I am afraid the reader will be disappointed. In the photographic market there are various actinometers which are said to be absolutely effective in giving a knowledge of the exposure necessary under every condition; but alas! "though faith is a precious grace," faith in them has been shattered a long time ago as regards myself. I will merely take a couple of examples to show how deceitful any artifice of the kind must prove. A landscape in sunlight in a cloudless sky is illuminated by at least two distinct lights—one that of the sun, and the other that of the sky; the high lights, of course, are those illuminated by sunlight, and the shadows by those of the sky. The shadows beneath trees, of course, is light reflected from the surroundings. This last illumination we will leave out of consideration.

The question comes, can we judge of the exposure necessary to give a landscape when illumined by these two sources alone? Comparing sunlight in Switzerland at a reasonably high elevation of, say, 5,000 feet, with that in England, it is found that its chemical effect at the same distance above the horizon is often eight to one in favour of the former, and rarely less than five to one; while the blue sky in England has often an advantage of four to one over that in Switzerland.

In Switzerland, therefore, the shadows will be very dark compared with those in England, and the high lights brighter. Now from which light are you to judge of the necessary exposure to give? and what actinometer are you to employ in such circumstances? The only rule that I know of is to give sufficient exposure for the shadows, and by careful development to bring out the high lights in their proper gradation. Some of your readers will doubtless exclaim that this means over-exposure for parts of the plate. Impetuous reader! please remember that if you have the *right* plate, there is, within limits, no such thing as over-exposure. And the right plate is one containing plenty of iodide, and behind that, a man with ordinary reasoning power, and patience, who can use brains in mixing his developing solution, and does not swear by ferrous oxalate, Beach, or any other god, but can afford to spend half an hour in getting out a good negative. Finally, expose fully, and don't think it the sign of being a great photographer to give an exposure of a fraction of a second.

THE ELECTRIC LIGHT IN THE DARK-ROOM.

BY S. BOTTONE.

Are there any real advantages attending the use of incandescent lamps in the dark room? The cheapest incandescent light costs considerably more than the most expensive oil, wax, or gas light now in use. But this would not matter if there was anything to be gained by using it. The incandescent light, unless the filament is kept only just red hot, is considerably richer in actinic rays than the oil lamp, the candle, or even gas; hence, the incandescent light wants shading more carefully with some non-actinic medium. The only advantage which is tangible in the use of the electric light in the dark room is the absolute freedom from fumes or other products from combustion, and the very slight rise of temperature which ensues. But these advantages are certainly countervailed by the greater necessity for deeper ruby shading, and by the mess and inconvenience inseparable from the use of a battery. I do not consider a dynamo in this connection, as no one would care to erect a dynamo for the sake of his dark room only.

TOUCHING RE-TOUCHING.

BY A. H. WALL.

While it must be admitted that the practice of "re-touching," or, more correctly, touching, the negative is greatly abused, it has many legitimate reasons for its support, and might, with advantage, be more largely extended in both portraiture and landscape. It would surprise many to see what may be done, for instance, in giving the tones of foreground and near foliage greater relative truthfulness, and bringing into prominence loose sprays and branches upon which the light is or should be strongest; thus modelling into relief masses nearest the spectator, and thereby giving retiring value to more distant portions, and a characteristic expression of varying depths and leafy lightness only too often wanting in tree-foliage. How common it is to see, for instance, landscape photographs embracing near trees taken in shadow, where everything tells of strong brilliant light, and shadows full of delicate reflections—sky, cloud, water, &c., until you come to shadowed grass and foliage. There, as a rule, midnight reigns. The lights are low in tone, weak, and scarcely distinguishable; and the shadows heavy, black, and without detail, the masses sticking closely together. There is no suggestion of loose, rustling, restless leaves, always on the flutter or quiver, with the whispering breeze and the flickering gold of sunlight playing in their green transparent depths. You cannot fancy birds flitting in and out and up and down in those gloomy, opaque masses of solidity. It seems, on the contrary, as if thick impenetrable darkness reigned within their depths too dense to be pierced by anything short of a rifle bullet. We all know this is, and must be, false to nature, and here it seems to me the artistic (not the mechanical) retoucher may find for his, or her, labours a new and very important field.

Again, we often have landscape negatives otherwise good, but too thin and transparent to give bold and vigorous effect in the print. Here the retoucher may step in, and by increasing the opacity with his refined and delicate stippling where it is required, enable the printer to give longer exposure in the printing than he would otherwise venture upon, and so improve the result artistically or picturesquely.

In photographs of water the brilliancy of flashes and sparkles of light are apt to lose sharpness and distinctness, and to become blurred and shapeless, when they ought to be crisp and sharp. Here, again, is a legitimate opportunity for the judicious retoucher.

In photographic portraiture the re-toucher often misses a famous opportunity of bringing out a head, or losing an ugly outline, or softening one that is too glaringly hard, and therefore unduly prominent, by confining his attention entirely to the flesh.

And lastly, but by no means leastly, in retouching faces and hands the utmost care should be exercised to avoid overdoing. A few months ago a very dear old friend of mine, a single look at whose genial face and jovial good-natured expression is as exhilarating as a capital glass of the best wine, sent me his latest photograph from a retouched negative. I was shocked to discover how frightfully unnatural, how utterly unlike the delightful, dear old face in my memory, this smooth, opaque, immovable ghastly mask was. There was not a bit of bone or muscle visible or suggested, no blood beneath it, no delicate tracery of veins seen on the temples or under the eyes, no possibility of the fixed, rigid lips, I know to be so mobile and changeful, ever moving again. It was a dreadful sight! There were no varying degrees of softness and hardness. It was all hard; horribly so, like stone, and, worst of all, with this unlikeness to anything which could express motion, feeling, or life, there was yet a likeness to one whom I never knew to be for a moment inactive in thought, or sympathy, or stolidly unemotional. In retouching, the operator—unless he or she is what he or she very seldom, indeed, appears to be, an artist—should err rather on the side of doing too little than too much. Above all, this penciller should be watchful to preserve the varying degrees of transparency and opacity, increasing the opacity and lessening the transparency, and thus blending and softening the whole, but sacrificing nothing. *Gain by retouching all you can, and lose as little as possible!* should be every retoucher's golden and unchangeable rule.

Flesh over bone assumes a polish, remember, which differs from that of flesh above a muscle, or flesh where it is thinnest, over the veins. Consequently in strengthening high lights do not use the same touching for both.

In strengthening lights into the eyes you may very easily ruin their expression, and give them an unnatural glare more suggestive of glass optics than the real organs of vision. Carefully consider where the light falls from, and the angle at which it reaches the iris or pupil. I have seen the softening effect of the eyelid's shadow, and the beautiful tenderness given to eloquently expressive eyes, by the long silken fringe of their lashes, utterly ruined by great clumsily put in blotches of white, which some inartistic blunderer has sacriligeously substituted for the softly subdued "spark," as it is technically called by portrait painters.

But I must pull up my subject steed sharply, as it evinces a disposition to run away with me, and dash into the spaces allotted to my brethren of the Annual. So, whoa! whoa! let me get down, and here! boy, pull off my riding boots!

EXPOSURE v. DEVELOPMENT.

BY CHAPMAN JONES.

In the early days of gelatine plates, when formulæ for development were not so plentiful as they are at present, it was shown by some of the leaders in photographic matters that exposure might be varied without any harm to the negative, if the development was varied to suit the changed conditions. In spite of this, we not unfrequently see the time of exposure considered as a very important item that must be fixed within the narrowest limits to avoid disastrous results.

If a ready mixed developer is used—that is, if the plate is allowed to develop itself—the exposure must be exactly suitable; but when the operator develops, the chief desiderata are plenty of exposure, a knowledge of the subject, and a distinct idea of what is required. With these the photographer is able to show his skill in producing the negative; he is not troubled by finding development flag and stop because the effect of the exposure is exhausted; he has surplus exposure which he can draw upon if required, almost in the same way in which he has more re-agents in his bottles.

For out-door work in general it is, and always must be, impossible to calculate the exposure suited to any ready-made developer, because the light that is effective is not all visible. It is convenient then, when possible, to give two or three times the exposure which we think will do, and so make the chance of under-exposure a scarcely recognizable quantity. And it is satisfactory to know that under-exposure, if it should occur, is not aggravated, but apparently sometimes even reduced by slow and cautious development; that is, the power of a developer is no less when it is gradually brought up to full strength, than when the strong solution is applied from the first.

It is probable that the more the work done by the light, and the less by the developer, the finer is the resulting deposit of silver, and the more truthful is the gradation of opacity. Strong developers are useful, and it is well that gelatine plates will stand them; but we should not make a practice of calling out our reserve forces on every occasion.

EXPOSURES.

BY FRANCIS COBB.

One of the most bewildering things that an aspiring photographer has to master is the different exposures necessary to be given to outdoor work. If he be wise, he will watch the working of more experienced men, and profit by what he sees; but if he asks the more experienced workers the reasons of their several exposures, the answers he will receive will not tend very much to his enlightenment.

He has plenty of tables of exposures to assist him. There are three which, when combined, ought to be able to reduce to scientific accuracy the exact time the cap should be off. And doubtless, if the experimenter looks up all three tables properly, and makes all the different calculations correctly, he will, "if lucky," have succeeded in making a very proper exposure. I say if lucky, for notwithstanding his elaborate calculations, luck will still have been an element in his success. There are, and have been for years past, actinometers, and a very elaborate one is on view this year at the Photographic Exhibition. These are at times of great assistance in estimating an exposure. I recall an instance where a party of photographers were saved from wrong exposures by one of the Sciopticon Co.'s instruments. It was a case in which the afternoon sun was flooding the interior of a cathedral with rich mellow light, but the actinometer refused to recognize this light, and it was only after the instrument had been tested outside that it was realised how the light came in filtered, by the red and yellow glass, of its actinic powers. But a more difficult case happened recently in the West of England, where, on a fine afternoon, I found myself, together with a photographic friend, about to take an architectural subject. While waiting for the removal of a van, which had placed itself, after the manner of vans, so as to block our view, we discussed the exposure necessary, and my friend, after consulting a Stanley actinometer, agreed with my estimate. Presently the van moved away, and we uncapped. After the exposure we both agreed that we had given more exposure than we said we would, but, with other work to do, the matter was dismissed for the time. After dinner at our hotel, we discussed the question—why did we, after having very carefully calculated the required exposure, and agreed to it, both of us give more than we had intended? After a long discussion my friend arrived at the conclusion that it arose from "an instinct founded on experience"—which, to say the least, is a wrong expression. If it were correct, the instinct ought to have acted when we deliberately calculated the exposure required, aided, as we were, by a very good instrument. Neither of us could give a reason connected with our surroundings, or anything that had suddenly occurred to alter our expressed opinions. The prolonged exposures proved to be correct ones, but why they were given must remain one of those photographic mysteries which "no fellow can make out."

I find a very good actinometer can be made from a strip of bromide paper and an empty match box—the French or Italian paper-box sold for a halfpenny. Double the last match over the end of the strip of paper, and roll it up as thick as the box will carry, let the draw fly back, leaving the end of the paper projected, to be drawn out as required. The test colour is placed on the top of the box.

PRELIMINARY HYPO BATH FOR UNDER-EXPOSED NEGATIVES.

BY W. E. WOODBURY.

Of late, many so-called preliminary baths have from time to time been recommended in the German photographic journals. There is no doubt that by treating a gelatine emulsion plate with a very weak solution of hyposulphite of soda, immediately before developing, it considerably accelerates the appearance of the image, with all the details and with sufficient density. Although this is unquestionably a fact, it appears that many believe that with proper exposure and continued development with the ferrous oxalate developer, equally good results can be obtained, without the use of the hypo bath. In order to prove if this was so, I have recently made a few experiments in this direction. I took an exposed plate and cut it into two halves. Half I placed in hyposulphite of soda solution 1 to 5,000, and afterwards thoroughly washed. On developing the two halves in the same dish, with ferrous oxalate developer, the half that had been immersed in the hypo bath showed a decided progress as compared with the other half; and after the development was completed, it certainly appeared to me to have received a more correct exposure, the other half being rather under-exposed.

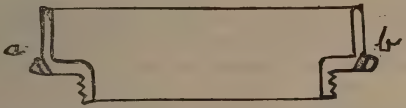
Thus I find that although the results obtained with either process are the same, provided the exposure and development are sufficient, yet it must certainly be remarked that with the use of the preliminary hypo bath, the time necessary for the exposure of the plate is considerably reduced, the developing process is accelerated, and the strong contrasts are avoided. For instantaneous exposures, this process will no doubt be of great value. Negatives made by it are vigorous and dense enough to print well, although existence of a slight but harmless fog cannot be denied; this is possibly due to the immersion in the water (for the action of the hyposulphite must be very slight), as it will be found that bathing a plate in water before development will tend to fog, although it will contribute to flowing the developer more uniformly over it. If a strong solution of hypo be used, or the plate bathed for a long time, it will create fog, and cause all kinds of deposits and irregularities upon the plate. A solution not stronger than already mentioned should be used, and the plate should not be allowed to remain longer than one minute in it.

A CONVENIENT ARRANGEMENT FOR THE CAP AND STOPS.

BY A. HOLLICK.

Photographers have, no doubt, often felt the inconvenience of the separate cap and pocket of stops, and the risk of mislaying them at a critical moment, even when only one set is used, let alone two or three sets.

I had two small holes drilled at opposite sides through the bead of the hood of one of my lenses, as per sketch at *a* and *b*. To one of these holes the cap is attached by fine string or wire; and the pocket of stops to the other, the string being passed, not only through the handles of the stops, but through the lid of the pocket also. Experience will soon show the most convenient length of the strings. By this arrangement there is no hunting in various pockets for the stops, and there is no fear of losing them or the cap; and I was so impressed with the comfort of it, that I treated my other lenses in the same manner.



INTENSIFICATION OF GELATINE NEGATIVES.

BY ANON, JUNR.

A simple and an efficacious method of intensifying gelatine negatives I find to be with iodide of mercury, having used it with great success for a considerable time. The formula was originally published in one of the journals, and no doubt has been extensively used. For the sake of those who have not seen it, I will describe the mode of procedure, together with a few modifications suggested by constant use.

I first of all make a saturated solution of bichloride of mercury in water—say a Winchester three parts full. (Only a comparatively small quantity of mercury is required for the purpose.) Of this I take two ounces, and add to it in small quantities (stirring the while with a glass-rod till each addition is dissolved) about 2 drachms of iodide potassium. A bright red precipitate is formed immediately ; and the iodide is added until this precipitate is dissolved. If two drachms should not be found sufficient for the purpose, add more ; if too much, stop when the result is obtained. I generally find 1 drachm of iodide to 1 ounce saturated solution of mercury about the right quantity. Now add 16 ounces of water, and it is ready for use.

To intensify, thoroughly wash the negative after fixing, and proceed with 2 ounces of the above for a half-plate till the required density is obtained ; then thoroughly wash, and fix in a weak solution of hypo for a short time. This latter is indispensable. A strong solution of hypo would reduce the negative to its original condition in a very short time. And should the intensification have been carried too far, this can be rectified by allowing the negative to remain in the hypo long enough. Four to six half-plates may be intensified in 2 ounces of solution, hence I keep a bottle in which I preserve the intensifier already used, and employ it till exhausted. This is better than returning it to the stock solution.

Negatives by this method may be intensified in broad daylight. Modifications may be made by the operator to suit the class of negative in hand. Should very great density be required, 8 ounces of water instead of 16 may be used, and so on. Thorough washing before and after intensifying must on no account be omitted. I find that a rose, similar to those used in watering gardens with a hose, is a capital thing for washing negatives. They may be procured at almost any ironmongers, and fitted to the ordinary tap with india-rubber tubing. The small jets, coming as they do with great force, far more effectually remove hypo than the same quantity through a single aperture in the ordinary way would do.

SLOW EMULSIONS FOR POSITIVES ON PAPER AND GLASS.

BY W. M. ASHMAN.

THOSE of us who, a few years ago, predicted a leading position among the printing processes for the method of producing silver positives by development, feel a certain degree of satisfaction at the medallistic recognition lately bestowed upon that class of work.

With early and recent examples of bromide printing before me, it appears a little difficult to point out just how much improvement has been imported into the manipulations within the past three or four years. Perhaps some may be recognized in the direction of vigour and purity of tone, for the commercially prepared papers now on the market leave nothing whatever to be desired in that respect. Another advance the manufacturers may be credited with is the employment of coarse paper for large work. A short time ago a number of these prints were handed round among several photographic experts, together with others on platinotype paper; but so closely did they resemble each other that there was not one present who could name definitely the mode of producing either print. Seeing that bromide prints can be turned out at exceedingly low rates, especially if one coats the paper themselves, it is scarcely worth while contemplating the ultimate future of the rival process, platinotype.

The accompanying formula yields—in the writer's hands—a very good positive on paper or glass; it is slow, but that is not altogether a disadvantage, for it needs no restraining bromide in the developer, which may be either pyrogallol and soda, or ferrous oxalate. The latter is, however, best for paper work. It will be noticed that the proportions of silver bromide and gelatine are extremely low, but they are high enough for a print bearing a similar appearance to that of platinotype; an increase of the former will confer greater brilliance, and of the latter a somewhat glazed surface.

A.—Nelson's No. 1 gelatine	4 parts
Potassium bromide	16 ,,
Citric acid	½ part
Ordinary water	480 parts

Soak fifteen minutes, then heat to 200° F.

B.—Silver nitrate	20 parts
Citric acid	½ part
Water	90 parts

Heat to 200° F., and mix with A.

Set aside for twelve hours, re-melt, and add 20 parts of Heinrich's gelatine, stand the vessel in boiling water, and allow to cool. When set, wash, re-melt, adding 100 parts of methylated alcohol and 900 parts of water; filter, and coat paper or plates. Respecting the former, ordinary photographic papers are suitable, especially if previously treated with some kind of substratum. A ten-grain gelatine solution containing a small percentage of chrome alum answers well in most cases, but a less proportion of gelatine may be used on some papers. The Autotype Company's transfer papers are also admirably suited for the purpose These may be soaked in water slightly warmed, and laid upon a glass plate also moderately warm. The mixture is poured over, and the whole placed on a level shelf to set, after which the paper may be suspended to dry in a dark room. The sensitometer test shows the above emulsion to be 8° Warnerke.

A HINT ON STORING NEGATIVES.

BY W. JEROME HARRISON.

Years ago, when my negatives were counted by tens, I found the well-known grooved boxes fairly convenient. Yet they had at least two objections. In the first place, if the glass plates were a little too large—and plate-cutters are apt to cut them so occasionally—there was a difficulty in getting them in and out of the grooves, since they jammed from their too great width. But a still worse feature was the liability to scratch an adjoining plate when replacing one which had been taken out for printing. This did not happen so frequently when matters were in my own hands; but when I got a "careful boy" to help in printing, I stood aghast at the way in which scratches appeared across the most conspicuous parts of my best negatives.

Casting about for a better plan, I had a wooden box made without any grooves, just wide enough to take my negatives easily (5 by 4), and a foot in length inside. I then bought some paper envelopes of the proper size (5 by 4), and placed a negative in each, writing the name and number of each negative upon the flap of the envelope. These envelopes—each containing its negative—were then placed within the box, the flaps standing upright. Each box will hold 120 negatives, and I keep at the end of the box a few coloured cards. When I want a negative, I turn over the raised flaps of paper till I find the one I require, take it out, and insert a coloured card in its place. When the negative is returned the card is, of course, removed.

I found the envelopes were hardly made of stout enough paper to stand long wear and tear, so in my later boxes I have replaced them by paper bags—sample bags for corn, I think they are called—which can be obtained very cheaply at any paper-bag factory.

For comfort and safety I do not think this plan can be surpassed. I know that it is used by many amateurs, but as so many recruits join our ranks yearly, I thought a description of it might not be out of place in the pages of the Year-Book.

Of course every amateur keeps a list of his negatives in a stout memorandum book. Each should bear its number, which should be repeated on the envelope in which the negative is kept, and on the right hand top corner of the negative itself. For gumming on the glass, nothing is so handy as the sheets of numbers sold for the use of entomologists; they are small, and printed on thin tinted paper. They can be obtained from almost any dealer in insects, &c., or from Newman, West, and Co., Hatton Garden. On the outside of each negative box should be marked the numbers of the first and the last negative it contains.

In this way one's most highly prized possessions are kept safe and clean, and easy of reference.

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CUTTING SENSITIZED PAPER.

BY EGERTON M. C. MACDONA.

To those amateurs who are in the habit of printing off their negatives themselves, and of which I am one, I would like to suggest a method which I generally adopt of cutting the prepared paper to the size required for use. The suggestion may seem obvious enough to many, but I think there are still a good few who find even this branch of photography an intolerable bore, and would be glad to dispense with it.

I do not myself go in for photography on a very large scale, and when getting sensitized paper, buy it by the quarter quire, finding this the most economical way, even if I at last have to throw away a sheet as useless, or even more. I have still in my mind the trouble I had to put up with when wishing to cut my paper for printing, my struggles to unroll it and keep it flat, combined with the fear of touching the sensitized side with my fingers, lest it might by some chance become soiled or greasy. Much trouble may be saved by the following method :—

A glass cutting-shape of the required size should first be obtained, after which the paper is unrolled, and spread out face downwards on a number of newspapers or other paper, laid flat on the table. Of course these papers must not be greasy, or at any rate not the paper at the top, next to the albumen. The object of these papers is to avoid cutting the table. The whole of the sensitized paper should be cut at once, as this saves constant trouble afterwards. The four ends of the roll are weighted down, and the paper cut with a sharp knife to the size of the cutting-shape. Care should be taken to cut through all the sensitized paper, for in this way much extra labour will be saved. It would also be better to use a cutting-shape of a large size, as there is not much difficulty in cutting the paper into a smaller size afterwards, as wanted. When cut, the paper should be stored up in old cardboard negative boxes, with a few slips of clean blotting-paper soaked in ordinary washing soda interspersed here and there, which will keep it from discolouration. Paper stored in this way should keep for months.

ON NAMING PICTURES AND ON CRITICISM.

BY WILLIAM ADCOCK.

Title to a book is important, but in a degree slight to what it is in a picture. If a book of imagination interests its reader, the *why* its title is given to it is patiently waited for. A page may reveal an incident which warrants a name, and this may be the first, the last, or any other page.

It is different with a picture—all is exposed at once. There is the mystery, and its name is the key to it. The name should be what is absolutely conveyed, or the picture is depreciated. From this cause photographs suffer greatly. A fine work by a most distinguished photographer was, in my opinion, utterly ruined by appearing with a high-sounding title which had no relation to it. A girl was laughing at a fellow standing at a gate. She was chaffing him, and the natural title of the picture would have been "Chaff." To name a photograph is often very difficult, but whatever is sacrificed in getting a title, the action or sentiment of the picture must be told by it.

The criticism of pictures is one of the absurdities of opinion. Criticism by experts is seldom assailable. They who write for publication know what they are about; but thousands of people see a picture without the slightest idea of what it would convey, without the slightest pleasure being conveyed to them by it, or without any definite idea of its merits.

For such persons there is one opening; incapable of detecting a beauty, they look for a fault. They are the too-long armed, the too-short legged, or the too-big footed order of critics. On these apparent blemishes they are learned, and talk confidently. Unacquainted with every phase of painting, they have no idea of masterly as distinct from slovenly work. Too matter-of-fact to know a spade as anything but a spade, they prize that knowledge beyond any appertaining to the ideal in life, for this they hold valueless.

Now to have photographs judged by these critics is depressing. That picture, whether painting or photograph, is not the best which all who run may read. A work, I think, in which intent is evident, even though unrealized, is better than common-place successful manipulation, where all thoughtful motive is absent. To too many people the sharpness and smartery of a photograph are more prizeable than the poetry and feeling of the subject.

It must be admitted that in large towns, those who habitually visit galleries have of late years thrown off the ignorance of art which prevailed thirty years ago; but it will take another thirty years to attain the same results in small towns and country villages; yet there are in these places notable exceptions, arising generally from inherent love of art, rather than opportunity for studying its canons.

ON RETOUCHING.

BY CRAWFORD BARNES.

In these days, when the art is in such great request, the following remarks, which I make from personal experience, may be of use to fellow-workers.

Retouching, now, is mostly done on a medium; there are several in use which are very nice to work upon, &c., but this is not all; we all know that a dry plate requires to be varnished to protect it from damp. Now comes the point. There are several mediums in use which the spirit in the varnish acts upon, playing sad havoc with the retouching, for it comes to be found, when the negative is varnished, that the retouching is removed, and left on places where it was never intended to be.

I think it behoves all retouchers—especially those who do not see their negatives—after varnishing to see to this, and to understand the ingredients of medium and varnish, and their relations to one another. I prefer to touch after varnishing.

LANTERN SLIDES ON GELATINO-CHLORIDE OF SILVER.

BY C. C. C.

THE directions now sent out with gelatino-chloride plates are so full that it seems scarcely possible or necessary to add to the instruction contained in them. Perhaps I may be allowed, however, to go into particulars a little more than they do, and make a few remarks based upon experience—an experience perhaps limited, I acknowledge in all humility.

It is difficult to obtain satisfactory results from an exposure to a paraffin light. There is a want of penetrating power, so that even when submitted to its influence for quite a tedious length of time, a plate upon development fails to give a clean picture. With negatives rather dense, I have been in the habit of burning one inch of magnesium ribbon at a distance of eight inches with good results. I never use anything but magnesium ribbon now ; daylight must be so uncertain in its intensity. As the density of negatives has so great an influence upon exposure, it would not be amiss to say here that it seems advisable that a person whose main object is the production of slides should, like the platinotype printer, remember for what he is going to use his negative when it is developed and fixed. A negative of fair average density will, of course, give a good slide, but I should say it was easier to obtain a good slide from one where development had not been pushed to the average density.

The special developers recommended may be discarded in favour of the simple ferrous-oxalate in the following proportions, with which two or three kinds of blacks may be obtained :—

Potassium oxalate (saturated solution) ...	4 drachms
Ferrous sulphate ,, ,, ...	1 drachm
Potassium bromide (1 per cent. solution) ...	5 minims
Water	Up to 1 ounce

If this be alkaline when mixed, the result given will be a colourless black, much resembling the tone of a platinotype print, and is recommended where the subject is architectural. The cool grey of an old building's stones is more happily matched by such a tone than by the collodion-plate colour, which, however, may please some people better. Something like it is obtained by rendering the mixed developer neutral. A tint still bluer may be obtained by rendering the developer decidedly acid. Landscapes I prefer to see in a warm colour. As the plate-makers say, this is obtained to a depth of redness depending only on the length of exposure and the amount of restrainer. Red tones seem less tractable than black. As a base of operations, try the burning of 2 inches of magnesium at a distance of 4 inches, and the use of the above developer —alkaline—but restrained with 12 grains of bromide to the ounce.

Mr. Cowan urges the over-development of the plate, and the subsequent use of a reducer. This is a very good plan, and I am grateful to him for the tip which he gave me some time ago, for it adds much to the brilliancy of transparencies on all the makes of chloride plates I have tried. A finished wet slide should be transparent enough to show some detail when laid upon a white porcelain surface, such as the bottom of a dish; but it should not be forgotten that it will be a little more intense, and, if of a red tone, slightly changed in colour when dry.

The exposures given above are those arrived at from the use of the plates I like best and have used most, Cowan's. Edwards' will be found a little quicker, and for the black tones may be placed at 12 instead of 8 inches distance, and so on; developer the same.

LENSES FOR PORTRAITURE—THE SINGLE LENS FOR LARGE WORK.

BY W. K. BURTON.

VERY often it has been pointed out that when we come to large direct portraits, a single achromatic combination lens forms as good an instrument as the most expensive portrait lens; but I have not, that I am aware, seen any good reasons given why this should be so in the case of large portraits, and not in the case of small.

The reason is, in reality, simple. The sole advantage which the portrait lens possesses, as compared with a single combination, lies in its very great comparative rapidity, whilst its disadvantages are many; not the least of them being the very great cost of large portrait lenses. Now, in the case of very large portraits, it is not possible, for purely optical reasons, to make use of the one distinguishing quality of the portrait lens—its rapidity—and, therefore, a slower lens, cheaper, and having certain good qualities which, in the case of the portrait lens, have been sacrificed to a rapidity of action (which, after all, cannot be made use of), may be used with advantage.

To explain matters further, I shall take a set of hypothetical examples.

A carte picture is to be taken, and the photographer uses a lens, we will say, of 8-inch focus, 2 inches diameter—the ratio being $\frac{f}{4}$, the ordinary portrait lens ratio. He will find no difficulty in getting the whole of the image quite as sharp as is necessary for pictorial effect, even if a sitting position be selected. But an attempt is made next to take a cabinet portrait with a lens of 3 inches diameter and 12 inches focal length—the same ratio of aperture appertaining as before. It will now be found very difficult to avoid, except in certain cases, getting some parts of the figure out of focus to a degree painful to the eye, on account of the small depth of focus. It will generally be found that it is necessary to stop down the lens. Still there are many cases in which a lens of the size mentioned can be used full aperture, and, therefore, the instrument is a useful one for the photographer to possess.

We go a step further, however, and have a lens of 16 inch focus, 4 inches diameter (still $\frac{f}{4}$). This is a lens of focal length suitable for a picture on a plate $8\frac{1}{2}$ by $6\frac{1}{2}$.

But how often will it be found possible to make use of the full aperture of such a lens? Scarcely ever, I think. The largest aperture that it will be found possible to use will be 3 inches, or a little under, except in a very few cases. And a lens of 3 inches maximum diameter would be of just about as much use as that of 4 inches; that is to say, a lens of the D or universal form, or one of the new A form of Suter's, all of which work at about the aperture mentioned, would be as useful as the expensive portrait objective.

We shall now take a considerable jump, and imagine that a portrait on a plate 15 by 12 has to be done. Certainly the lens used should not be of a lesser focal length than 24 inches or thereby, unless the picture be a large head.

Concerning the focal length of the lens to be used in portraiture, I would remind your readers of the very excellent rule—first, I believe, enunciated by Dallmeyer—that the focal length of a lens used for portraiture should never be much less than twice the length of the portrait that we take. This rule, however, it must be borne in mind, applies to the focal length of the lens *in use*, to the lesser conjugate focus—not to the focus for parallel rays, commonly called the principal focus. Every one knows that when a near object has to be portrayed, the distance between the lens and the ground glass has to be increased. This increase is trifling in the case of short focus lenses; so that, in the case of these instruments, if the length of studio will permit it, the actual focal length should be twice the length of the largest picture to be taken. As the principal focus of the lenses become greater, however, the increase of focal lengths, due to focussing for a near object, is proportionately greater, so that the lesser conjugate focus of a lens of 24 inch principal focus would be very nearly 30 inches, even when the subject is a full length figure; that is to say, it would be about twice the length of the plate I have imagined, namely 15 by 12. Indeed, if the camera were approached very near to the sitter, with the object of taking only a small portion of the subject, the focal length of the lens will be above 30 inches. Thus, if the camera be subjected for a head and shoulders half-life size, the lesser conjugate focus (distance from optical centre of lens to ground glass) will be increased to 36 inches, and a plate 18 by 16, or even 20 by 16, might be used. If a life-sized head were to be taken, the focal length will be increased to 48 inches, and a plate 24 by 18 may be covered.

I have tried to explain why, when we come up to very long focus lenses, we may cover plates relatively larger than with short focus lenses, and with certain subjects very much larger relatively.

To return, however, to the portrait—say of a sitting figure—to be taken on a plate 15 by 12, with a lens 24 inches focus and a maximum diameter of 6 inches ($\frac{f}{4}$). It will be found, I think I may safely state, that it is *always* necessary to stop the lens down to an aperture at least as small as 3 inches, so as to get different planes of the subject in tolerable focus. But this aperture is one that can be obtained with a lens of the rapid landscape class, which certainly has many advantages in respect to marginal definition, &c., over a portrait lens, even when the portrait objective is stopped down to the same aperture. Yet we will frequently find the professional worker using the cumbrous portrait lens rather than the rapid landscape doublet. If we enquire into his reasons, it will be found to be a matter of superstition pure and simple. The photographer imagines that inasmuch as the big lens is doubled "*portrait*," it must be in some occult way particularly suitable to portraiture. But, as Huxley would perhaps put it, there is no more any such quality as "portrosity" in a portrait lens than there is a principle of "aquosity" in water.

The applicability of a lens to portraiture depends on certain distinct and definite qualities, all of which, except one, are found to exist in a higher degree in almost any lens but a portrait combination; that one is rapidity, and, as I have attempted to show, this one quality is only available for use in comparatively short focus instruments.

We have only to go a few steps farther, say to 30 or 36 inch focus, and we will find that we cannot ever avail ourselves of the rapidity of the rapider forms of landscape lenses, and that we may as well—and as I shall attempt to prove later—make use of the slower single lens.

What I have tried to demonstrate, so far, may be summed up briefly as follows :—

In using, for portraiture, lenses of various focal lengths, the available (or usable) angular aperture (aperture in terms of focal length) becomes smaller as the focal length increases, on account of decrease of "depth of definition," and it is desirable, in all cases, to use a lens whose maximum defining aperture exceeds, as little as may be, the available aperture. To this I would add a few words on the particular form of lens known as the single achromatic lens, endeavouring to point out that when we come to work with focal length so great that we cannot utilize a larger aperture than that afforded by the single lens, it (the single lens) is the best that can be used.

In the first place, it will, I think, generally be admitted that it is a distinct advantage to reduce the number of reflecting surfaces in a lens, and it is of course the case that the reflecting surfaces of the single lens are only half in number of those of rapid landscape lenses, or of the new improved portrait lenses of Voigtlander and Dallmeyer, whilst they are but one-third in number those of the Petzval portrait lens.

But there is an impression amongst photographers generally—Heaven knows whence got—that the distortion given by a portrait lens renders it unfit for portraiture. I have not time to enter into this matter here, nor, I presume, would the Editor of the YEAR-BOOK willingly afford me space, so I satisfy myself by stating—dogmatically, it may be—that if the rule be observed, that the actual focal length of the lens in use be twice the length of the picture produced, the displacement of any point of the image of the figure will be so small that the most delicate mathematical instruments could scarcely render it observable, and will be merely a minute fraction of that due to unequal expansion of the paper on which a print is produced.

The point wherein the single lens, I think, shows a superiority over others for portraiture, is in the matter of so-called diffusion of focus.

The nature of this diffusion of focus is more or less known, but not, as a rule, very accurately. The object of the diffusion is to increase the amount of depth of focus, and, if it is true—as it certainly is—that no such arrangement can increase the difference of definition of any two planes, it is equally true that, by reducing the amount of definition of the best defined plane, it may make the definition of other planes—really worse than where no diffusion existed—appear to be better defined, because there is nothing showing wiry sharpness in close proximity with them, to afford comparison.

With short focus instruments there is naturally so great a depth of focus that there is no necessity to introduce diffusion, which, moreover, would be very objectionable in the case of negatives which might be enlarged from, or prints from which might be examinedvery closely, often by the aid of a magnifying glass.

In the case of portraiture on a large scale, however, it is quite different. Large negatives are seldom or never enlarged from, and prints from them should never be looked at but from some distance. This being the case, some diffusion of focus is at least admissible—probably it is advantageous.

Now diffusion of focus is nothing more than another name for spherical aberration, and in the case of a single lens it is only necessary, in order to produce any amount of spherical aberration required, to open out the working aperture to a certain extent. It may thus be seen that by using the single lens with the largest aperture possible (and therefore at its rapidest), the quality termed "diffusion of focus" is introduced. And it is for this reason that, whenever we come up to very great focal lengths, it is sometimes possible to use a larger aperture with a single lens than with a lens of the doublet form, the exquisite definition given in one plane by the latter form of lens merely serving to make evident the lack of depth of focus possessed by all lenses of very great focal length.

Concerning the best forms of angle lens to use, I may say that the older forms, which were plano-convex, or which very closely approached that form, will allow, in my experience, of a larger aperture than the modern deep meniscus forms of lens which are intended to embrace a wide angle. I have generally been able, with such lenses as the old A. Ross single, to use an aperture equal to 8 U. S.; that is to say, $\frac{f}{11 \cdot 3}$. This is an aperture which will give sufficient depth of focus up to a very large size.

Recently I have had an opportunity of trying a single lens by W.

Wray, which has the remarkable property of working at the very large aperture 4 U. S , or $\frac{f}{8}$, and which gives at that aperture quite as fine definition as is, I think, desirable in large portraits. Indeed, were I using the lens for such work, I should incline even to increase the aperture a little, so as to get the diffusion I have been speaking of.

HOW TO TAKE SILVER STAINS OUT OF A GELATINE NEGATIVE.

BY J. V. DRAKE.

Soak the plate for five minutes in clean water ; meanwhile make a solution of iodide of potassium, 20 grains to an ounce of water ; now put the plate in this solution, and let it stay for ten minutes. If the stain is very old, keep it in for half an hour. Now dissolve half drachm of cyanide of potassium in one ounce of water. Take the plate and put it into this, and gently rub the stains with a tuft of cotton wool, free from grit, until they are quite gone. If the stains are very old, make the solutions stronger, and soak for a longer time.

CAN ELECTRICAL BALANCE BECOME AN ACTINOMETER?

BY JOSEPH PLENER.

No doubt amongst the readers of this Year-Book there will be some who are experimenting with electrical balance. To these gentlemen I wish to communicate the following observation :—A putrid (through long keeping) emulsion generally darkens very quickly when exposed to the daylight ; but if it be separated, and to the silver compound be added a little of liquid ammonia, then this property of darkening is so much increased that in the sunlight the silver compound darkens nearly instantaneously. Now what will be the effect of this reduced silver on an electric balance ? This is an interesting question, and those experimenting with electrical balance may, perhaps, think it worth while to inquire into the subject and to answer the question.

Let us suppose that the equilibrium of the balance is broken by the action of the light on the silver compound, or, better to say, by the consequent reduction of the latter ; then the time necessary to bring about this reduction might be taken as measure of the sensitiveness of the silver compound. But if by experiments the silver compound remains the same, and only the lights change, then the time necessary for a certain light to produce disturbtion of equilibrium might serve as the measure of the actinism of the light used. In this way a very convenient actinometer could be constructed, by means of which it would be very easy to find the exact relation of the two given lights. Such an actinometer might be of special value in spectral photography, because it would enable us to define exactly the relative actinic powers of the different spectral rays, and to trace the exact curves of the same.

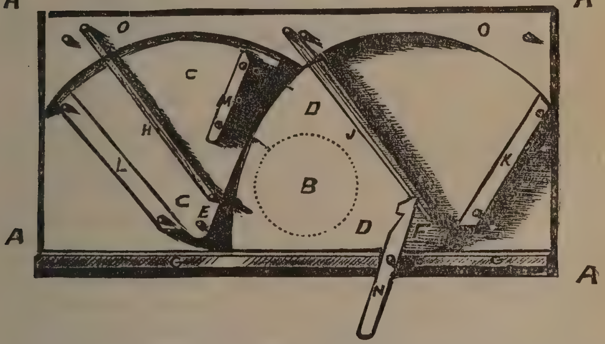
A CHEAP AND EFFICIENT SHUTTER.

BY H. W. HOLLIS, F.R.A.S.

Much has been written about appliances for securing very rapid exposures, but I think I may contribute a mite to the literature of the subject by describing a shutter which may be made at a cost of a few pence, and will be found as efficient as most of the ingenious and more or less expensive articles which have been designed for the purpose. I have used clockwork shutters, snap shutters, flap shutters, drop shutters, revolving shutters, pneumatic shutters, brass shutters, ebonite shutters, wood shutters; and have expended pounds upon such pieces of apparatus, and not one of them has given me better results than the simple affair I am about to describe, which I made myself, and which any amateur who possesses a sharp knife, a pair of compasses, a dozen screws, a bradawl, two india-rubber bands, an old cigar-box, and two hours of spare time, may easily construct. I will describe the shutter which I use with a Ross 8½ by 6½ rapid symmetrical lens.

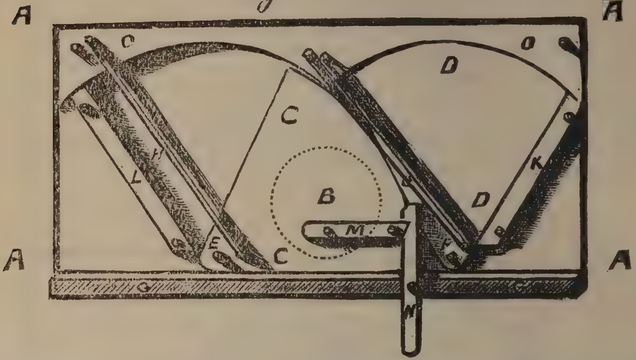
In fig. 1, AAAA is a piece of bay wood, 11 inches by 5, 3-16ths thick.

Fig. 1.



A hole to fit lens is cut as shown by dotted circle B. Two shutters, CC and DD, each about the sixth part of a circle of 4 inches radius, and 3-16ths thick, are arranged as shown to turn about the screws E and F. GG is a ledge projecting 3-16ths above the face of the board A. H and J are india-rubber bands. At the back of the board A, a piece 3 inches square and 3-16ths thick is screwed, through which the lens-hole B passes, so as to give a deeper hold for the lens than would be afforded by the thickness of A alone. At the top of the board A is screwed the piece OO, 3-16ths thick, which is scalloped out as shown to fit the curved edges of both shutters without touching them, and so prevent light getting between the shutters and the board, and possibly reaching the lens. To set the apparatus for an exposure, pull the shutter DD over to the right, stretching thereby the band J, until the right edge of the shutter rests against the stop K, and then pull the shutter CC to the right and downwards, stretching band H until the little block M comes into the notch in the swinging catch N, by which it is held fast. The left hand edge of the shutter DD is now resting against the curved edge of the shutter CC, both bands being in tension, and the apparatus appears as shown in fig. 2.

Fig. 2.



On releasing the catch N by moving its lower end to the left, shutter CC flies back against the stop L, uncovering the lens; and when the curved edge of CC has cleared the corner of DD, the latter flies down against the ledge GG, thus closing the lens. It will be seen that the exposure begins and ends with the foreground, as should always be the case, and that the lens is opened to its full aperture. The rapidity of the exposure may be controlled to a considerable extent by regulating the strength of the india-rubber bands. I have taken with this appliance some exquisite pictures of breaking waves in a stormy sea, and—must I confess it?—have yielded to the miserable ambition which takes possession of every tyro in shutter work to photograph a moving train, which I did with perfect success.

A SIMPLE VIEW-METER.

BY FRED. B. TAYLOR.

The following is a suggestion for a very simple view-meter :—It consists merely of a jointed twelve-inch rule. By opening this to a V, and placing the apex against the cheek, it is easy to observe the angle subtended by any object. A chord of degrees for a circle of six inches radius is marked along the upper edge of the camera back, or on the base-board. By applying the extremities of the V to this, the angle is read off, and a small table in the note-book tells at a glance what sized plate will be required for any of the lenses attached to the camera, or what lens should be used with a given plate.

A specimen table is subjoined :—

Focal Length of Lens.									Side of Plate.
4	5	6	8	9	10	12	16	18	
41	33	28	21	18	17	14	11	9	3
53	43	37	28	25	22	18	14	12	4
64	53	45	34	31	28	23	17	15	5
82	70	60	47	42	38	32	24	22	7

The above is for a 7½ by 5 camera; a table for a larger camera, or for other lenses, may be constructed from a table of natural tangents, with the aid of the following formula :—Tangent of half the included angle × focal length of lens is equal to half the length of plate, or even by means of a protractor and a T square.

It will be useful to notice how closely a scale of inches divided into tenths, approximates to the chord of degrees.

HINTS TO YOUNG HANDS.

BY F. P. CEMBRANO.

When I undertook my first photographic trip, I was much bothered when packing and unpacking my plates. Later on I managed things more comfortably by using grooved boxes or plate-books, but still there was a drawback. The room my dry-plate packages took was enormous. At last a friend pointed out an easy and practical way, which I now adopt, as I find it the simplest of all I have seen. Get long slips of tissue paper, an inch or two wider than the greatest length of your plates. Sandwich your first two plates with an equal amount of paper, then fold this over and pile on another plate; fold the paper again and add another plate, and so on, until your plates are rolled up in the length of tissue paper at your disposal; of course the film side should lie on the tissue paper. One wrapper of orange or black, and another of brown paper, completes the packing, and to hold the ends firm nothing is handier than an elastic band. Plates thus packed can be carried in a hand-bag; they are then under your own supervision, and will not run the risk of breakage in the luggage van. Besides, small parcels carried by hand are seldom opened when passing the Custom House.

When starting for a photographic tour, it will be found prudent to carry a little concentrated developer, *papier maché* dishes, &c. These articles do not take much room, and they enable one to develop occasionally at night time, to see how the exposures are going on. Better carry a few ounces more weight than to find on your return that all your plates have been wrongly exposed.

Apropos of exposures, I suppose 1 must do like everybody, and give a pet formula. The following one I have found good for under-exposure, but of course, only for mild cases:—To each ounce of water add 6 to 8 grains sulpho-pyro, and 2 to 3 minims of ammonia—no bromide—and plenty of patience. Development will not show till one or two minutes have passed, and may not be finished in less than fifteen or even thirty minutes.

For cutting nicely masks for lantern slides, the Woodbury trimmer is a good little instrument; still, for masks with square corners, I prefer a scalpel or a small surgical knife. On the other hand, nothing beats a shoemaker's knife for cutting prints; it costs little and lasts long.

To those unfortunate beings who still use ruby light in their dark room, 1 should strongly advise to try golden fabric only once, and feel sure they will always use it. I have four thicknesses, and though my window is large, and I develop within six inches and right in front of it, I never get a plate fogged by that light. Every little detail can be seen perfectly well, and I can even read comfortably, while waiting during long development.

Keep your negatives in envelopes a little larger than the size of the plate, and with the opening at the narrow end. In this way you will be able to keep them in order, and to write on each one any interesting remarks, such as name of subject, exposure, &c.

QUICK-ACTING SHUTTERS.

BY RICHARD PARR.

EVERY shutter that I have tried has some fault which greatly impairs its worth for small, intensely sharp negatives intended for enlargement. My plan is to test them on the optical lantern, and I find that practically the "go and return" shutter, fitted in the "stop" slot of the lens, is the best in the market at present, and is all that can be desired both for portability, rapidity, and extra exposure to the foreground; but it has one serious defect, *i. e.*, a considerable vibration at the critical moment when the lens is full open, caused by the reversal of the motion of the shutter. This is, for my purpose at all events, a fatal objection, and after many further troublesome experiments I had to come back to first principles in the form of the simple drop shutter. In that reversed, I have found my desiderata, viz., about ten per cent. excess of exposure to foreground, a rapid exposure, and a minimum of vibration.

I should probably have overlooked the first named had I not used the lantern for testing, as, with it, the falling shutter of course exposed the foreground first, and was then only moving slowly, while the vibration caused by its coming to rest occurred after the exposure, and when it could do no harm. From this I saw at once that by causing my shutter to fall upwards, I should get all I wanted. I have secured this by making the shutter of No. 30 B.W. gauge, hard optician's brass, to slip into the "stop" slot, the slot being cut right through the bottom of the lens mount. The frame of the shutter forms the stop and has the aperture cut in it, and the shutter slides in front of this in grooves made by turning up the edges of the frame. The shutter is held down when set by a very small catch below the lens mount, and it is drawn up by a watch-spring on the top of the mount, so held that its tension can be altered as desired to give more or less time for exposure.

The whole concern for a stop aperture of five-eighths of an inch weighs under one ounce, and the moving part about ten grains.

PHOTO-ENGRAVING.

BY W. T. WILKINSON.

In Line.—For this process a negative is made from the drawin (woodcut, &c.), which must be entirely a line-subject, washes being quite inadmissable. The negative must be as dense as possible, with the lines clear glass. From this negative a print is made upon a zinc plate, coated with albumen and bichromate of potash, exposed to light in a printing frame provided with screws instead of springs to give pressure, as the contact between the two must be absolute. The exposure is timed by means of an actinometer, and in a good light will only occupy a few minutes. After exposure the plate is coated with a thin film of photo-litho transfer ink, by means of a composition roller, and the image developed by immersing in a dish of cold water, and removing unaltered albumen by gently rubbing with a pledget of cotton-wool. The image is then dried, and coated with a strong solution of gum, which is allowed to dry. Now take an india-rubber roller, and with a palette knife place upon it a little fine litho printing ink, mixed with a little wax and palm oil, and thinned with middle varnish, and upon the inking slab distribute the ink thoroughly all over the roller. Now lay the gummed print upon zinc, in a suitable position for inking, and, with a sponge well charged with water, rub gently two or three times, then proceed to roll up the image with a steady to-and-fro motion, pausing now and again to re-charge the roller and apply a fresh modicum of water. The image being rolled up, it is placed in the first etching bath, consisting of—

Water	30 parts
Nitric acid	1 part

Allow the plate to remain in this solution (rocking gently all the time) for three minutes, then remove and wash under a tap, and rub with a very fine sponge ; now dry gently upon a hot plate, then coat with gum, and fan dry. When the gum is dry, proceed to roll up, using the india-rubber roller, and when the rolling-up is complete, place upon the hot plate, so as to slightly melt the ink, and make it run over the edges of the first etch; then coat the back and edges of zinc plate with bitumen varnish, so as to protect them from the acid, and immerse again in the acid bath. Then wash, gum, fan dry, and again roll up, using a leather roller; and when rolling up is completed, dry, and cover with finely-powdered resin from a fine sieve, removing superfluous resin with a camel's hair brush. Then place the zinc upon the hot plate, and melt the resin, so that it is incorporated with the ink-resist. It is then again placed in the acid bath (reinforced with a little nitric acid) for ten minutes, after which the same routine is repeated (using the leather roller for the next etch, and afterwards a roller covered with fine flannel) until the whites are of a sufficient depth. Then the resist is cleared off, and the plate rolled up with the flannel roller charged with hot wax ink, and then immersed in a stronger acid bath to clear away the steps made by each etch.

The above is a brief outline of the process of making raised blocks by photography from line drawings.

In Half-Tone.—For this process a proof is required from a machine-ruled plate, from which are to be made negatives absolutely sharp and clear, these negatives being called screens. One of these screens being selected, it is placed in front of the sensitive plate in the dark slide, the photograph it is desired to reproduce being exposed through the screen, the result being a grained negative. From the grained negative thus obtained a print is made upon zinc, dried, coated with gum, and rolled up with the india-rubber roller. It is then etched for one minute in an acid bath containing 1 part acid to 100 of water; then washed, gummed, dried, and rolled up again, etched for five minutes. Then the process is repeated three or four times more, when the resist may be cleared off, and the block is ready for trimming and mounting type high.

A CHEAP AND SERVICEABLE STAND, AND HOW TO MAKE IT.

BY JOHN DUGDALE.

HAVING procured three broom-handles, as free from knots as possible, saw them about three parts of their length down the centre. Insert a screw just below where the cut is made to prevent splitting; then procure six small brass plates, shape of a dome, with three small holes; two bottom ones are screwed inside leg top, one to take pin of triangle. Then taper ends of each leg with spokeshave or plane to give them a little shape, insert screw at bottom of each, file off heads to prevent slipping. Then cut out triangle from a hard piece of wood; when done, insert a screw each side of triangle, filing off heads of screws; then give all a rub up with glass paper, stain, and varnish. When done, you have a strong and serviceable tripod, fit for any reasonable sized camera, at the bare outlay of one shilling.

WORK FOR THE PHOTOGRAPHIC CONVENTION.

BY TALBOT ARCHER.

Now that we have got a body which is intended to represent the photographers of the British Isles, we naturally ask the question—"What may we reasonably expect the Convention to do?" Are the energies of the Secretary and the Council to be exclusively confined to the proceedings at the annual meeting, or is there nothing which might engage their attention for the remaining portion of the year?

To begin with, it is certain that if photographers generally are to be induced to enrol themselves under the banner of the Convention—and to pay five shillings for the privilege—some greater inducements must be held out than the mere permission to attend a meeting. Take the case of the Midland Union of Natural History Societies, which has now been at work for eight years, and includes about twenty societies and 2,500 members. In their case it is found that an annual subscription from each member of threepence is sufficient to defray the necessary expenses of the annual meeting, together with the cost of a gold medal which is presented annually to the author of the best paper contributed to the organ of the Union—the *Midland Naturalist.*

One of the most useful things which could be done by the Photographic Convention would be the establishment of a complete library of photographic literature for the use of its members. All our great scientific societies—the Chemical, the Royal, the Geological, &c.—possess special libraries of the most extensive description. The Photographic Society of Great Britain ought to have formed such a library, but it has not, and there is a great chance for the Convention to supply a much-needed want. The books should be at the disposal of members living in any part of the country, each member, of course, defraying the cost of carriage, and retaining any given volume for a limited time only. In the "Bibliography of Photography," which has appeared in the PHOTOGRAPHIC NEWS during 1886, we have, for the first time, a more or less complete catalogue of all British books on the subject. But, in addition to these, the collection I propose should contain every foreign work on photography that could be obtained.

In the same manner representative albums of photographs might be formed, with accompanying note-books containing criticisms, and these should be lent out as required.

In time a collection of apparatus might be formed, similar to that possessed by the Royal Astronomical Society. There are many curious and costly pieces of apparatus, whose use is required at rare intervals only, and it would be a great boon to be able to borrow such occasionally.

An even more important task would be the preparation of a Photographic Tourist's Hand-book to the United Kingdom. This might be done in sections, a county at a time. It should be liberally illustrated by maps, &c., and should contain as much information as possible about places worthy of visit, together with the time of day best suited for securing them, &c. By the co-operation of the large body of photographers spread over our islands, an immense mass of matter could rapidly be collected, and when it was properly arranged and published, it would meet with a ready sale.

Then the Convention might follow the example of the 'Cyclists Touring Club, and appoint consuls for every district—men able and willing to afford information to the photographic wayfarer.

Besides the annual meeting, I would advocate district meetings—say once a quarter—when the members living in any given neighbourhood could meet for excursions or social purposes for a few hours. Such local meetings would be best held under the auspices of local societies.

And here I may say that I think it would have been better if the Convention had been based on a union of societies rather than individuals. The photographic societies of our islands greatly need some bond of union, and this would have been admirably supplied by the Convention. By bringing the societies into a compact union a body would have been formed which would have had great prestige and a vastly extended membership. The members present at the first meeting of the Convention at Derby last August did not exceed some fifty or sixty in number, and unless there are very large additions to the ranks before the next meeting at Glasgow, it will not be possible to consider the body as representing British photographers generally.

I have alluded above to a few of the things which our Convention might take in hand at once—just as a beginning—when these are satisfactorily arranged, there will be no difficulty in finding many more.

AMMONIA POISONING.

BY P. H. EMERSON. B.A, M.B. (CANTAB.)

Two years ago I wrote, warning photographers to pay particular attention to the ventilation of their dark rooms. Since that time, several photographers have written to me, and described their sufferings after having developed a large batch of plates. The symptoms undoubtedly point to bad ventilation and ammonia poisoning combined. Now I must here emphatically repeat my warning, and insist that the only cure is complete and scientific ventilation of the dark room, at no matter what cost. I have been in several dark rooms during the last two years, and, with very few exceptions, there was no ventilation at all in them.

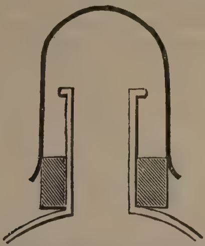
There is one effect of ammonia, about which I am making enquiries, and my readers can help me if they refer to this year's *Year-Book of the "British Journal of Photography,"* so that we will put aside for the present, and turn our attention to the other equally baneful effect. It may not be generally known that ammonia is a powerful poison, the fatal dose of the solution being estimated at one teaspoonful. Death has been known to follow within *four minutes* of such a dose. When we consider what a quantity of ammonia in the gaseous form is set free during the development of a large batch of plates, the vital importance of good ventilation becomes evident. Not only is the ammonia set free in great quantities, but the developer, in his eagerness to watch the progress of his plates, bends his head until his air passages are within a few inches of the developer, and thus inhales much more than he otherwise would do. The symptoms thus caused by bad ventilation, where ammonia is used in developing, are, a feeling of heaviness and general malaise, accompanied or followed by throbbing headache, and sometimes dizziness ; the eyes feel heavy, and the mucous membranes of the air passages hot and irritable. The photographer feels altogether out of sorts, and if he continues his work, his digestion begins to suffer, his bowels become deranged, and he gets low-spirited and melancholic.

I can but repeat : the only cure for all this is perfect ventilation. All photographers should at once look into the matter, and engage the services of a good sanitary engineer, if they wish to preserve their health.

A VARNISH BOTTLE.

BY C. H. BOTHAMLEY, F.C.S.

EVERY experienced photographer knows only too well the troubles which arise from the use of corks in varnish bottles. The cork becomes cemented to the neck, and either breaks in the process of removal, or leaves small fragments of cork adhering to the inside of the neck, to say nothing of those which fall into the varnish and make filtration necessary. Bottles with glass caps ground to fit can be purchased, but they are somewhat expensive ; and, moreover, if a drop of varnish finds its way between the cap and the bottle neck, and is left there, it cements the two firmly together. The following plan will be found cheap and efficient. An ordinary bottle with a fairly long neck is taken, and a thick cylindrical ring of india-rubber is slipped over the neck down to the junction of the neck with the bottle, care being taken that the india-rubber projects beyond the welt of the neck. A short, wide test-tube fits on the ring, and forms a cap to the bottle. If broken, it is easily replaced at a trifling cost.



The excess of varnish from the plates should always be poured off into a second bottle, and when this is full the varnish is filtered back into the capped bottle.

FINISHING SILVER PRINTS.

BY HENRY STURMEY.

The following method of finishing silver prints, when intended to be kept unmounted, may be new to some readers of the YEAR-BOOK, though I expect it to be an old idea to the majority. Still, as I have never seen it mentioned in print before, and as I chanced on the exact method myself, perhaps it may prove of interest. It is well known that to squeegee the wet print face down upon glass or polished vulcanite, and allow it there to dry, results sometimes in the total loss of the print by its sticking to the glass, and generally in a quickly drying print with a very high surface gloss. This gloss is all very well in its way, but I imagine, to most lovers of the beautiful, it is rather too much of a good thing. Now it struck me that I might obtain good results by squeegeeing the prints on to glass or vulcanite, and removing them whilst wet. I tried the experiment, and the results so fully answered my expectations, that I have since adopted the system in all cases where I am dealing with prints for my unmounted portfolios.

My plan is to remove the print from the vulcanite directly I have pressed it on, and finish the drying under pressure between blotting-paper. I find the squeegeeing presses the water out, and that the prints dry in less than half the time they take ordinarily, whilst they come out when dry with a much smoother and more even surface than can be obtained by ironing, which process is saved; and that whilst possessing this finer surface, they have not that high and inartistic gloss which is given them if left to dry upon the vulcanite.

WILLESDEN PAPER FOR PHOTOGRAPHIC USE.

BY BAYNHAM JONES.

I WAS much interested in the exhibit at last year's "Inventories" of the capabilities of the Willesden paper, which comprised, *inter alia*, life-boats and other vessels, which require not only to be waterproof, but, at the same time, to combine great strength. I was, however, surprised and disappointed at not finding photographic dishes, funnels, and other photographic requisites in the stall. I concluded that these matters had been overlooked by the manufacturers, and that I should in the course of a few weeks find all the photographic stores filled with them.

Some thirty years since I visited Messrs. Jennings and Betteridges' *papier-maché* manufactory at Birmingham, for the purpose of having some dishes made for the Calotype process, which I was then working;

and from what I then saw I was greatly impressed with the idea that *papier-maché* must shortly, to a great extent, take the place of wood, metal, and earthenware. Messrs. Jennings and Betteridge made me some excellent trays up to 15 by 13 inches, and these (with the exception of two which have been broken by falling on a stone floor) are now in use. As most of your readers are, no doubt, aware, *papier-maché* articles are made by two processes—the one being paper pulp cast in moulds; the other of sheets of paper pasted together, and, while damp, pressed into shape. Tea trays and similar articles are made by the last method. On removal from the moulds the articles are stoved under a considerable amount of heat (after having been coloured and varnished), and this process renders them rather brittle.

The material may be used for many purposes after being simply dried, and in that state it is very strong and durable; it is not, however, waterproof, but this defect may be easily remedied by coating with shellac varnish, or, if preferred, by painting and polishing in the same way as the panels of carriages are done. The latter process not only renders them waterproof, but they resist the action of nearly all the chemicals used in photography; concentrated cyanide is almost the only thing I am aware of which will act injuriously, and that only to the extent of dulling the varnish. The material, after simply drying, is capable of being planed, turned in a lathe, screwed, and dovetailed, and it decidedly has the advantage over wood, both as respects strength and lightness. I have some pieces nearly an inch thick, and as hard as a board.

If some of my readers are camera makers, I should strongly recommend them to make a trial of the Willesden paper, which I imagine comprises all the good qualities of *papier-maché*, with several others in addition; and I feel assured that the result will be very profitable—at any rate, it will not waste much time nor money if unsuccessful. There is another advantage I have forgotten to name, which is that the paper is not liable to warp, and slides made of it are not likely to stick fast, as wooden ones frequently do.

ON KNOWING SOME OF THE PROPERTIES OF A BROMIDE PLATE AT SIGHT.

BY A. PUMPHREY.

The difference between the mechanical operator and the photographer whose work is to him both an art and a science, appears to me to lie very much how much insight he has into the variedd properties of the materials he uses. In meeting with fellow-workers in the field, and comparing notes, one will say, "I use such a make of plates;" but if asked what kind it was, how was it made, they seemed to think that was no part of their business to either know or enquire. To such, photography may be an art, but hardly a science.

I have, myself, laid down some general distinctions which, although they may not be new, may be of service to that large class who never make their own plates.

There are two broad distinctions in the plates made in the market now: those which are made sensitive by boiling or stewing, and those which are made sensitive by the use of ammonia in some way or other. These two I consider can be told at sight: those prepared with ammonia are a darker yellow, having even a tint of green in the yellow; those prepared by stewing are a lighter or lemon yellow—of course, the quicker the plate, the darker is the colour. The two makes can easily be distinguished if examined by daylight; the light of the dark-room or lamp-light will not serve to tell one shade of colour from the other.

As good a negative can be made on one plate as the other, providing the exposure be adequate to the sensitiveness of the plate. As quick a plate can be made by one process as the other—at least, that is my experience, and I know of different makes of plates which I think are prepared, one by stewing, and the other with ammonia, and the speed of one is equal to the other.

But there are other properties besides speed, and I have always decided the advantage to lie in favour of the stewed emulsion; it will stand much more forcing in case the exposure is too short, and, what is perhaps of still more importance, the plates keep much better.

A highly-sensitive plate is, I think, at its best as soon as made, but the ammonia plate deteriorates more quickly than the stewed. I have noted in all brands of plates prepared with ammonia (as I think) indications of change when kept a few months.

A plate containing iodide as well as bromide may be known by the development starting slower than in a film containing only bromide of silver; the indication is of course a comparative one.

If a plate is coated with substratum, it can often by told by tearing the film when just developed before the films of different solubility have been fully wet, and carefully examining the torn edges.

These are points which have come under my observation during the past twelve months, and may, I hope, serve as stepping stones to attentive observation by others.

LOCAL PROTECTION BEFORE INTENSIFYING.

BY W. COTESWORTH.

It often happens that one would like to intensify a negative, but is deterred from doing so by the fear of spoiling portions of it, such as a white dress or cap in a portrait, an east window in an interior, &c. I find that by diluting india-rubber solution, q.s., with benzine, it can be brought to a consistency which enables it to be applied with great accuracy with a camel hair paint brush; and with the high lights thus waterproofed the whole negative can be immersed in the intensifier until the darker portions are brought up to sufficient density. When dry, the india-rubber has only to be rubbed off with the finger, and leaves the negative quite clean.

ON VARIATION OF SPEED IN EMULSION.

BY A. L. HENDERSON.

I HAVE very little doubt that many of your readers have tried the formulas given from time to time in the pages of the journals, and did not succeed in getting the result stated or expected. One of the most common causes of failure regarding speed is the addition to the finished emulsion of fresh gelatine—*i.e.*, gelatine that has not gone through the process of breaking up and washing. In the case of a boiled emulsion more particularly, the addition of an acid gelatine to the ripe bromide will greatly lower the sensitiveness (sometimes ten degress on the sensitometer); not so with the ammoniacally made emulsion when the gelatine is added before washing. These facts have been fully borne out by the use of a centrifugal separator.

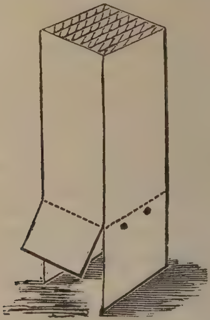
Now, the question is, how are we to prevent this? I am not prepared to say that the method I am going to recommend will be a perfect cure in all cases, as much may depend on the kind of gelatine employed. Suffice it to say that I have not failed up to the present time. The remedy is very simple. Place the fresh dry gelatine for a few minutes in a weak solution of liquid ammonia and water; it is better to let the ammonia and water stand mixed for a little time, so that if there is any lime in the water it will be precipitated first, about sixty minims to every two quarts of water; this will speedily neutralise the acid, and I dare say render soluble something in the gelatine which is better removed. Now well wash the ammoniated gelatine, and it can then be safely added to the emulsion.

There is only one drawback to this method, and that is the increase of bulk obtained beyond the desired quantity. True, this can be avoided to a certain extent by making the emulsion in a more concentrated state to begin with; but this, I am afraid, will complicate matters in another way. Of course, any one with a centrifugal separator is quite independent of quantity of solutions. But how is emulsion making to be done by those who have not got a separator? Why, don't add gelatine to the finished emulsion, but carefully make dry plates by any of the formulas published by the writer!

RESIDUES.

BY C. H. BOTHAMLEY, F.C.S.

PAPER residues, whether silver or platinum, may be burnt readily and without waste in the following simple apparatus. A piece of thin sheet iron or tin-plate, 26 inches by 20, is bent into the form of a chimney, 20 inches high and 6 inches square, 2 inches being allowed for the overlap. About 4 inches from the bottom two pieces of stout iron wire are fastened across the chimney, and support a piece of iron-wire gauze, which forms the grate. A similar piece of gauze is placed on the top of the chimney to prevent any fragments of paper being carried away by the draught. Two of the edges of the chimney are slit for a distance of about 4 inches from the bottom, in order that the iron or tin-plate may be bent outwards to allow the free entrance of air. The stove may be placed on a tray or plate of iron or tin-plate, which will catch any ash that may fall through the wire gauze.



ORTHOCHROMATIC AND ISOCHROMATIC *V.* BROMIDE PLATES.

BY J. WERGE.

After a series of careful, unsatisfactory, and disappointing experiments with eosine, I turned my attention to some commercial orthochromatic and isochromatic plates, with the hope of obtaining better translations of colours, either on pictures or coloured objects; with what results I shall now endeavour to explain.

In photographing a scale of colours (pigments) ranging from black to white according to their degree of luminosity to the eyes, I found that the orthochromatic plates did not translate these colours any better than an ordinary bromide plate; in fact, I think that the simple bromide plate had rather the best of it, both in density and degree of translation. I tried various times of exposure and various kinds of developers—pyro without ammonia—as recommended, and oxalate of iron, with similar results. I then tried isochromatic plates, with little or no better effect. The yellow pigments were still stubborn, and would not be coaxed into a better rendering. But, on placing natural colours before the isochromatic plates, the yellows yielded up their light in a most agreeable manner. I have always maintained that natural colours translated their relative light and shade more truthfully than pigments, and here was a most satisfactory evidence of the correctness of my theory and oft-repeated statement. The natural colours that I experimented upon were flowers, chiefly yellow dahlias, fuschias, red roses, and green leaves against a blue background, and, though the yellows translated considerably better on the isochromatic plates, I cannot say the same for the behaviour of the reds and greens. The reds are decidedly better translated on the bromide plate, but I think the greens, especially those with a yellowish tint, are the least thing better rendered on the isochromatic plate. On the whole, I think the greens show best on the orthochromatic plate, but the other colours appear flat, stale, and unsatisfactory. Take it for all in all, the isochromatic plate gives the best translation of natural colours in a group of flowers, but it is far from a true and correct translation. It is, however, a considerable step in advance, and shows that if isochromatic plates were employed in taking autumnal landscapes, a better result would be obtained, and a more sympathetic feeling between the lens and the season established. In the old Daguerreotype days the most skilful operators prepared their plates to suit the complexions of their sitters, and there ought to be a similar sympathy between the photographer and his sitters in the employment, if not the preparation, of the dry plates of to-day.

In conclusion, I shall be most happy to show the results of my experiments to anyone interested in the subject, and hope that others will publish their impressions and results of experiments, in the hope that something more satisfactory in the true translation of colours may yet be obtained.

P.S.—The orthochromatic plates I employed were of German manufacture, and the isochromatic French.

ON THINGS IN GENERAL.

BY A. R. DRESSER.

As technical matters will be no doubt treated in the YEAR-BOOK by abler minds than mine, I will indulge in a few remarks on things in general referring to photography.

As far as cameras, &c., are coucerned, nothing very new was shown in the Exhibition this year. There were a few new kind of shutters, but nothing any better than we had before; in fact, to my mind, none so good as we have.

In regard to paper for negatives in place of glass, plenty has been promised, and we were told glass was done for; but I know it is still ahead, and we shall have to get much better paper in the market before glass goes to the wall. Paper for negatives is of great use to those who travel much, and for use with a roller slide, and also for sizes larger than 8 by 10, as then the weight is much less, and the paper is much easier handled and developed; but with all that in its favour, it cannot hold its own. The faults against it are the amount of grain shown, and for anyone who wishes to enlarge or make magic lantern slides, it is hardly any use, as if you do manage to get a negative free from grain, ten to one it has marks on it, or else it is unevenly coated. As far as paper is concerned, a better make of paper has to be found before it does away with glass ; but I think next year we shall have a paper that will give glass a good shaking, as I have seen a paper quite as clear as glass, and requiring no oiling, which, if it can be worked and put in the market (which I am told can be done) will be a great blessing to amateurs, and also a good thing for the firm that brings it out. At present, films only pay to use when you want to travel and can carry a good roller slide. and then I much prefer it to glass, as if you do get one or two bad negative films, you might still do so had you used glass ; but for studio work or at home I much prefer glass.

Developers there is nothing new in, and, as far as I can learn, the developer known as the Beach potash is used by most amateurs, and now you seldom see the ammonia used. I prefer it to all except the soda one, and use both according to exposure of my negative. The one I find does best with all negatives (or plates) is the common washing soda one, viz., a saturated solution washing soda is kept for stock solution to develop. I take for half-plate 1½ ounces water, 60 drops pyro (sulpho-pyrogallol of the Platinotype Company) which contains 6 grains pyro to every 10 drops, 3 drops of bromide (10 per cent. solution), and 3 drams of the soda. This, as a rule, will bring up the picture without having to add more soda; but, if not, add soda a dram at a time till the picture appears (that is, if there is one to appear). You can add as much as 5 drams soda to the ounce of developer without getting chemical fog. One thing against this developer is, that it soon gets a dirty brown colour, and will give the negative a brown tint ; but that is cleared at once by keeping a stock solution of water and sulphuric acid, 1 ounce of acid to 40 of water, and pouring over the negative for a minute, and then washing. You can pour over either before or after the hypo bath, but after is the best, as it helps to get rid of the hypo. Always varnish negatives that you wish to keep, as it preserves the negative, and prevents silver marks from the paper when printing, and is much easier to retouch. Should you require at any time to remove the varnish, soak negative in methylated spirits for a few minutes, and all varnish will dissolve off.

As far as printing is concerned, I think most people use silver paper ready prepared. Which is the best to use is hard to say, but I find Marion's or Valentine Blanchard's the best; the latter will be found to tone and keep very well. For those who can work during the day time, silver paper or platinotype will be used, and which to use depends on what coloured print you require. Platinotype gives a print like a fine engraving, and is permanent, which is greatly in its favour. This paper is a little hard to learn to use, but, when properly managed, pays for the trouble, as beautiful results are to be got, as anyone could see who went to the Pall Mall Exhibition this year. The way to manage properly is to keep the paper negatives and pads dry, and follow rules sent out with said paper.

For those who are not able to work during daylight there are good papers in the market that give results as good as either of those I have mentioned, but the exposure has to be by artificial light, and, of course, the time to give has to be learnt by experience (as no image can be seen).

The first I shall mention is bromide (Eastman's), which, if properly exposed and developed, the resulting prints cannot be told from platinotype; but you must have a thin negative for this paper, and give a fair exposure and weak developer to get good results. I find about twenty-five seconds one foot from ordinary gas burner about right for a thin negative (but plenty of detail); I then follow rules laid down in formula sent, except that I make up developer as per formula, and add one ounce water to every four ounces of developer. Your print will come up slow, but you will not have such a black-and-white picture as if exposing less and using a stronger developer. The other paper for using by artificial light is "Alpha" paper. The exposure and development are the same as above, but the colour varies according to the exposure given. If a short exposure, a black or grey colour; and the longer the exposure the redder the colour. But, as a rule, a short exposure gives best results. It is easy to work, and you can hardly over-expose, as I gave, a day or two ago, the same negative (a thin one) from fifteen seconds to five minutes' exposure, and used same strengthened developer for all prints, and got fair results out of all, only the colour was different, and the five minute one had lost detail, as when it did come up it came up so quickly you had no control over it. I am very fond of Alpha paper, and think it is not enough known, and feel sure that if more knew of it, it would be for their good to try it, as one thing in its favour is the price, as it costs half what bromide papers do, and keeps for ever, I should think, as I used some to-day that I had opened last December.

Bromide and alpha opals are just the same as the papers, only the emulsion is put on opal. They are very nice, and the results got on them, as a rule, are very clear and soft.

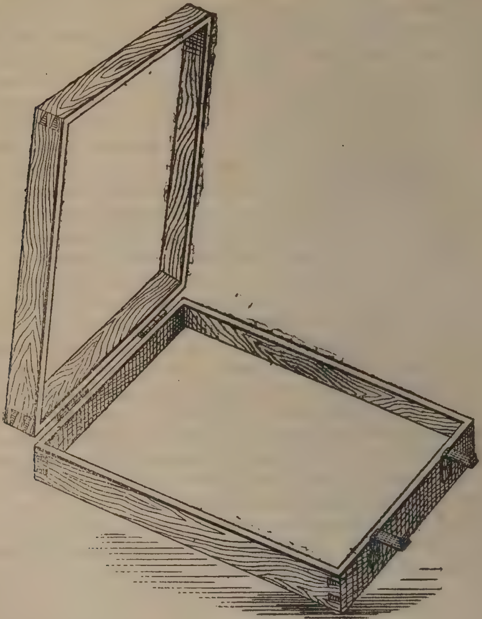
A DEVELOPING DISH FOR THE TRAVELLER.

BY J. CHESTER JERVIS.

I TOOK the idea from an American paper which has since been quoted on the subject by an English photographic journal, but I have not heard of the plan having been carried out practically in England.

It is a wooden double frame hinged, and the two sides, which meet when shut, are edged with india-rubber to clamp the plate for development, which then forms its own dish. The outside edge of the frame is $\frac{3}{8}$ of an inch larger than the plate, and the inside $\frac{3}{8}$ less, so that the edges with india-rubber are $\frac{3}{8}$ broad, and grip the plate $\frac{3}{16}$ all round, and leave the other $\frac{3}{16}$ outside to form a margin to make the dish water-tight when the plate is pressed tightly, which is effected by two fastenings on the opposite end to the hinges.

I took my original and self-made dish to Messrs. Wratten and Wainwright, whose manager (Mr. Smart) simplified and improved on my model. So I would recommend anyone wishing to have a properly constructed one made without trouble, to apply at 38, Great Queen Street.



The two chief advantages are, firstly, being able to watch the development by transmitted light without the removal of the plate; and secondly, the use of a minimum quantity of developer.

If the operator would like to have the further advantage of watching the progress and development without emptying the solution, he should have a narrow slip of glass, vulcanite, or wood, fastened across one end or side of the dish to form a well when the plate is tilted against the light. I should recommend in this case two frames, one for view, &c., taken horizontally long, and one for portraits, &c., taken vertically long.

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STANNOTYPE FOR TRANSPARENCIES.

BY WILLIAM LANG, JUN., F.C.S.

STANNOTYPE, as a process, cannot be said to have ever become a popular one. The totally different nature of the operations required, compared with the general run of photographic work, may have something to do with this. We all know that very excellent transparencies have been produced from the Woodbury mould: what is to prevent equally good results being obtained from the Stannotype mould? While the former process necessitated having a special and costly plant, the latter only requires the printing press.

Having recently prepared several moulds by Stannotype from one or two collodion transparencies, and having in turn reproduced the picture on glass of the ordinary lantern size, 3¼ by 3¼, it seems to me that in thus making use of Stannotype a means could be found of popularizing a truly beautiful and interesting process. I do not propose here dealing with the preparation of the mould, as this can be found scattered throughout the photographic journals; but say that a satisfactory mould has been obtained, and duly coated with tinfoil, the first operation connected with the production of the Stannotype transparency will be the steeping of the soft porous card (cut to the size of the glass on which the mould has been produced) in water for some little time. The cheap mounts made from wood pulp furnish an excellent material for this purpose. The card, after draining, is placed on the bed of the press, the mouldis deposited on it, having been slightly oiled with a mixture of olive and paraffin oils, and on the top of the mould the glass that is to receive the picture. The arch of the press is then brought gently down, care having been taken to see that all the screws have been loosened. The top plate of the press now rests, of its own weight, on the mould and the glass plate; this being so, the lever of the press is closed, and the first of the screws to tighten is the one immediately under the arch; the next in order is the one above the arch; and the final one to make fast is the lowest screw of all, the one which is attached to the top plate of the press. The lever having been released, the whole top portion moves now as one piece, and, being hinged, is put back as far as it will go. The glass is now removed from the mould, and as it will have received a certain amount of oil from the mould, it requires to be cleaned. The gelatine ink having been in the meantime brought to the required state of fluidity, a sufficient quantity (say about a sixth of the surface of the mould) is poured on the mould. Without loss of time the glass is placed gently down on the top of the mould and the ink. The top portion of the press is now brought down, and the lever made to close the whole. After standing for a minute or two the press is opened, and the gelatine mould picture is found attached to the glass. There is this difference in drawing these glass pictures in the press from the ordinary print on paper, that an adjustment of the press is necessary each time to suit the various thicknesses of glass made use of. Were this not done, fracture of the glass, either of that bearing the mould, or of the one that receives the picture, would be sure to ensue. Best results are obtainable with deep moulds, as the ink, being less rich in colouring material, gives greater transparency in the high lights. From the nature of the process tints of all kinds can be given to the resulting picture, from a pure Indian ink tone to the warmest silver one. It is generally known that the latter is imitated by a judicious mixture of Indian ink and carmine added to the fluid gelatine.

A PHOTOGRAPHER'S KIT.

BY WM. BROOKS.

When out on a tour I always like to be independent as regards help, if needs be, in carrying my apparatus. Some make a great mistake, especially amateurs, in having one large leather case or box in which to carry all their kit; I have seen not only amateurs, but professionals, make what I consider this great mistake. Photographic touring I think I have had my share of, having had something over twenty-five years, and after that perhaps many will concede that I know something about it, or at least ought to.

The way I make up my kit is this : in one package I have the camera, in another I have my dark slides or Hare's changing box, and in another bag, like a fishing-rod bag, I have my folding tripod stand. Each package has straps so that I can either sling it over my shoulder, or put my arm through it, and my lenses I carry in a courier bag which has a long strap which goes over my shoulder. On a tour I at least have a dozen lenses or more. Perhaps some of our amateur friends have to content themselves with one lens ; if such be the case, the lens can be carried in the pocket. I never go out without a focussing glass, which I prefer of the Ramsden eye-piece form. I fancy I hear some say, on reading this, " Why does he take so many lenses with him ? Surely they are not required ! " My answer to such a query is this : At times one has to get in all sorts of confined situations, and if with only one lens, that lens perhaps may only give a little more than half of the image ; such being the case, if another lens be used of half the focal length, or a little less, all can be got in as required, otherwise it would have to be given up as a bad job.

There is one thing in my apparatus I am very particular about, and that is the tripod. I never will use one of those sliding affairs—wood sliding into wood—for, with the slightest damp, they are bound to stick, and then there is pulling and tugging, and I was going to say praying, but perhaps it would be the reverse. Many of the makers will tell you that if the stand is made properly they should not stick ; but I generally reply that they cannot judge, as they are not the users. There is also another stand that I avoid, and that is the metal telescopic tube one. Once one of the tubes gets a rap and is indented, and they also stick ; but my chief objection to them is the vibration. I have never yet found any to equal the wooden ones. Perhaps I may be going a little too far.

I saw one a little time since, I think it was made of bamboo, it was very light and rigid, and there were no sliding parts in it.

I always mask (as I may term it) as much as possible my apparatus, for I detest to get into a train and some fellow-passenger asks if I take portraits, and how much I would take his for? Mine, when packed up, looks more like fishing tackle, and by that means I am left alone. By dividing my apparatus as I have stated, I have no difficulty in carrying a 9 by 7 camera, &c., the whole day without much difficulty or inconvenience. I have seen many with a smaller set packed altogether, yet tired out after about a mile.

A PLEA FOR THE PROFESSIONAL BEAUTY.

BY CHARLES E. PEARCE.

Having received the following letter, which I am quite incapable of answering, I have placed it in the hands of the Editor of the Year-Book, for him to deal with as he thinks fit.

Dear Sir,—I am not a professional beauty, but I would like to be one. It must be so nice to have one's photograph in the shop windows, and listen to what people say of you—because it is nearly always complimentary. Not that men ever go into raptures over photographs of pretty faces. No; it is we who generally are the admirers of our fellow—may I say fellow?—women. Isn't this curious? Still, men don't say anything positively unkind; though I did once hear two bearded men criticise Miss Anderson's arms most rudely. Said they were six inches too long, and out of drawing; and as for her nose—well, I won't tell you what they said about her nose, which I must own *is* a wee bit too large for *my* taste. But I am sure these men were *artists*, and artists don't count, because they are always dreadfully severe about one's features; as if you could help having a large mouth, or a short neck, or an ugly chin, or your eyes not quite the same size.

Some people are horrified at photographs of ladies being exhibited in the shop windows. They don't mind so much about actresses, because actresses, poor things, have to earn their living, and their photographs advertise them; but why ladies of title should be shown in the same way these good people can't understand. I call this *nonsense*. I don't suppose their fathers and mothers were so shocked when they looked over those dreadfully wearisome "Albums" and "Keepsakes" and "Books of Beauty;" and what the difference is between an engraving and a photograph I don't know, excepting that the photographer doesn't make you look quite so silly as the engraver used. If a woman is pretty, why shouldn't she be looked at? Indeed, *I* think that this is the only reason why she should be looked at. But the public—oh, that tiresome public! Who is it? What is it? Am I one of the public? Are you, dear, sir? The public won't have it so. They say there must be some reason beyond being merely pretty why a woman not an actress should have her photograph in the shop windows. She must have a title like the Countess of Dudley or Lady Lonsdale; or she must be a model—not an *ordinary* model, please, but a model who never sits to anybody but R.A.'s—like Miss Dorothy Dene; or she must have been in that wicked Divorce Court, or have committed a murder. I don't agree with this, but that is perhaps because I am only pretty. My idea of a "professional beauty" is, that she should have done nothing at all. Her only crime must be her good looks, and nobody must ask who she is. Isn't this a capital idea, and doesn't it open up a new profession to those of us who are beautiful?

I have been thinking that each beauty ought to have a fancy name, not exactly "Stella" and "Vanessa" and "Delia" and "Celia," and old-fashioned titles such as these, but something new; and I am sure it would add to the interest of each portrait if paragraphs could be inserted in the society journals about our manner and appearance in the studio. Just imagine having this, which I read recently in an American paper written about oneself: "Mrs. Cleveland (*the President's wife, you know*) came into the studio with Mrs. Lamont, smiling and chatting merrily. After removing her hat and some kind of light wrap, she said, sweetly, 'Now, Mr. West, I place myself in your hands for half an hour. Do with me what you will.' There was little work for the positionist (*what a dreadful name! We havn't 'positionists' in England, have we?*) to do, however. Mrs. Cleveland fell into the position best adapted for showing off her beautiful form and exquisite features, with a natural grace seldom seen even in veteran society women."

There, isn't that beautiful, and so is this: "The pose of her head in each position was superb. Her change of expression in some of the pictures was remarkable too. From the piquant, amused smile in the first, she took on (*what queer expressions these American writers do use, to be sure!*) a tender, dreamy look in the third sitting." It would be very nice to be spoken of in this manner, wouldn't it? But, perhaps, I like the way the photographer talks about Mrs. Senator Cameron a little better. He told the newspaper man who interviewed him that "the sight of her before the camera is enough to make any artist's heart throb. She is very beautiful, you know, but her grace of bearing is her greatest charm. Her very manner of sinking into the chair is suggestive of an ideal queen and a throne. No positionist would dare to suggest a change in the attitude she assumes." Fancy making the photographer's heart throb! I should almost be afraid to be so very lovely for fear he might get nervous and drop the glass and spoil my portrait. But how delightful never to be altered after having once taken one's seat!

Well, this is how our American photographers speak of us. At the end of the conversation with the newspaper man he says something which quite supports my idea of the true professional beauty. "Do you think that Mrs. Cleveland's new departure will induce other society women to put their pictures on exhibition?" asks the man. "No telling yet. I only hope so. It would be a fortunate thing for us. We are eagerly awaiting further developments." So you see the American photographers are quite ready, and why shouldn't the English ones be?

Now what I want to know most particularly is about this confusing, perplexing Copyright Act. I was reading in a back number of the PHOTOGRAPHIC NEWS something on the subject, but the more I read the more confused I got. Still, I did understand a few things. For instance, I find a photographer "cannot prevent any other person making another negative of the same object, even from the same point of view, and as nearly as possible under the same circumstances." Of course this applies to me, though I don't approve of being called an "object." But I am glad to know that no photographer can claim any particular view of my nose, and that I can have it photographed fifty different times by fifty different photographers, without any one claiming any copyright in it. Then I am told that "if a photographer take the portrait of a person of eminence or member of the Royal Family, musician, actor, &c., &c. (*I suppose the &c., &c., means professional beauty*) copyright can only be secured by a signed agreement made at or before the time of sitting between the person whose portrait is made and the person who makes the negative." Well, that's clear; but this is what I want advice upon: "In the present state of the law, it would seem to be absolutely necessary that, when a principal does not himself execute the work or have it done under his personal direction and supervision, he must have an assignment of the copyright from the person he employs, and who, in the eye of the law, is the true author."

Now isn't this aggravating? Really, I believe the eye of the law doesn't see straight sometimes. When I go into a studio, how am I to know who is the principal? Supposing one man "positionises" me, and another looks through the glass and takes off that thing in front like a large pill box lid, and a third goes away with the little flat box in his hand, and comes back after a while and shows me my portrait—who is the "true author?" How shocking it would be if they got to fighting over the copyright of me! Or they might not say a word to each other, and each might publish me, and perhaps go to law afterwards, and it would be so disagreeable to have one's name in the paper.

And how can I tell whether photographers themselves know the law? A principal might tell his assistant to photograph me, and not be in the studio at all. Well, then, the assistant would be the owner of the copyright, and if he is a very sharp fellow he might refuse to make an assignment, but publishes me at a penny a-piece, and I am sold on a costermonger's barrow! This would be too awful, and so I should like to know how to proceed to avoid such a horrid fate. Please let me know at once everything about this Copyright Act, and also tell me what kind of agreement I ought to have, whether a photographer should pay me to sit, or if I should have something, say three quarters of the money, on every copy he sells?—Yours, &c.,

VENUS DE MEDICI.

ENLARGEMENTS ON BROMIDE PAPER.

BY J. VINCENT ELSDEN, B.SC. (LOND.), F.C.S.

One of the greatest difficulties experienced by amateurs in their first attempts to produce enlargements upon bromide paper is the difficulty in procuring pure whites. However clean the dishes may have been, and however thoroughly the washing may have been effected, it not infrequently happens that the enlargement, on drying, shows a considerable amount of discolouration, completely spoiling its effect. The permanence of this discolouration is often such as to withstand all attempts to remove it. Clearing solutions may appear to have some temporary effect while the paper is wet, but, on drying, the yellowness reappears in all its vigour. It is astonishing, also, what a depreciatory effect even a very slight discolouration of the whites has upon the general appearance of the enlargement, and how flat and displeasing the most vigorous picture becomes under its influence.

Now I have never been troubled with any signs of yellowness after once adopting the following method, whereby the iron of the developer is prevented from becoming deposited in the fibres of the paper.

The method is not new, but at the same time it is not so universally known as it should be. After development, before any attempt is made to wash off any of the developer with water, the print is well washed with a solution of citric or acetic acid and alum. Of course the developer is previously drained from the print. By thus thoroughly acidifying the paper, before it comes into contact with any washing water, perfect purity is maintained in the whites after washing and drying. I have followed carefully the instructions supplied with several different samples of paper, but the above is the only method which, in my hands, has given perfectly satisfactory results.

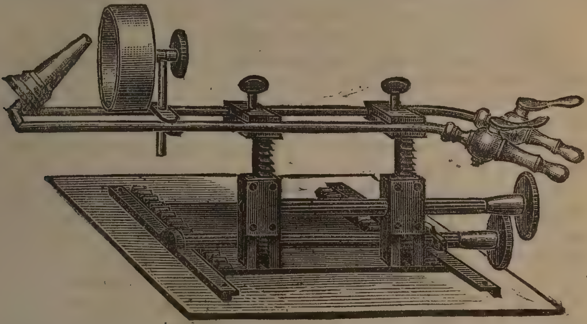
One word of caution is necessary, however—viz., to wash thoroughly before fixing, to avoid loss of half-tones by solution of the silver image.

AN IMPROVEMENT IN LIME LIGHT APPARATUS.

BY A. PUMPHREY.

I have always felt that the ordinary method of centering the light in the oxyhydrogen lantern was defective. The plan has been to have a slide with an upright pin upon it, to which the jet is attached ; the slide gave an adjustment of the distance of the light from the condenser, and the height of the light and its position in the centre is obtained by the clip of the jet on the pin.. The success of an exhibition so far as regards the light depends upon correct centering, which means an even, well-lighted field free from shade or colour. The adjustment on the pin is easily made if the operator has the room to himself, and no picture is being shown on the screen. Unfortunately, not only is the jet easily set, but it is quite as easily unset, and many an exhibition have I seen marred with a shade of colour creeping in at one side of the field from the light getting out of the centre.

I enclose a sketch of an arrangement which is more satisfactory to me



than any other I have tried. It consists in placing the jet on a stage much the same as the mechanical stage of the microscope, one set of racks raising the jet, and another moving it to the right or left; and, being placed on a slide, any adjustment can be made; even when the lantern is closed, and the exhibition is proceeding, the jet is held at two points, so that it cannot turn.

STATUARY PORTRAITS.

BY ROBERT OFFORD.

A PRACTICAL method of taking these pictures, without the exhibition of more or less distinct breaks in the continuity of the background, and of the remarkable halo frequently seen round the head, may perhaps be thought worthy of putting upon record in the PHOTOGRAPHIC YEAR-BOOK.

Several plans have been proposed, but it is quite possible that the one now to be described has not, as a whole, been made public. The first two points to be particularly regarded are, the arrangement of an absolutely black background carefully shaded, and of a vignetting contrivance in front of the lens and enclosing it. These will be found treated in detail in the YEAR-BOOK of PHOTOGRAPHY for 1884, p. 187.

So far it is simply the usual method of producing camera vignettes, with the vignette made somewhat wider at the base, and cut a little lower down. The next necessary is an opaque mask, attached to the carrier to cover about the upper third of the plate, the edge of it being of slightly convex curvature. A similar curve must be drawn on the ground glass in the position to be occupied by the edge of the mask. A slight variation is of no moment, and one trial will make it easy to modify it. A portrait taken with such a contrivance will present, when printed, the appearance of a head and bust, as in statuary on a black ground, the effect being heightened by the use of pale-coloured drapery or lace, and by a somewhat Rembrandtish style of lighting. There still remains the pedestal to be provided, and it is this part of the process (if any) that may lay the slightest claim to novelty.

Negatives must be taken, suitable for C.D.V.'s, cabinets, &c., from a plaster or marble pedestal rectilinear in outline, and lighted in more ways than one to suit variations in the portraiture. These negatives must be on paper or films, for herein lies their special adaptability to the purpose. Whichever form is used, it must be transparent, as it is necessary that the printing of it should take about the same time as the portrait. It then remains only to cut out the pedestal from the paper or film with knife or scissors, and to adjust it under the portrait so that the top edge of the former registers with the bottom edge of the latter, and both are printed together at one operation. The background will therefore be an unbroken black, and the join between the two subjects on the print will rarely want a single touch of the paint brush. Care, of course, must be exercised in opening the frame during printing, in order not to displace the pedestal negative; but if the back be one of those made to open longitudinally, even this precaution is unnecessary. The chief thing is to have the paper or film as thin as possible, and to print either on a turn-table, or with frequent changes of position, to work right up to the edge of it. It is, perhaps, superfluous to remark that the effect is anything but pleasing when one negative is taken in one light, and the other in another. The shadow that would be cast by the bust overhanging the pedestal may be fairly imitated by something superposed at the time of taking; or a bust with pedestal could be photographed, and the former would of course be removed in cutting ready for printing. It would, perhaps, be easy to stick the paper or film on to the glass plate, but as the same negative might be needed for another portrait, this would not be wise, unless it was done by a touch of rubber solution behind one or two high lights, when its removal could be effected without injury.

CHLORIDE EMULSION PAPER.

BY THE REV. A. M. MACDONA.

I HAVE recently come across a new paper that delights me much. It is Obernetter's chloride emulsion paper. Its advantages are as follows:—

a. It prints in a much shorter time than the ordinary albumen paper—no small boon in the dull winter days.

b. It tones very quickly to a rich warm brown, or a fine bluish purple, without the least difficulty, in the sulphocynide bath.

c. It gives very rich brilliant pictures, with great softness and transparency in the shadows.

d. It fixes in a much shorter time than the ordinary paper.

If the prints are squeegeed while wet, like paper negatives, on a sheet of ebonite, they will peel off, when dry, with that highly enamelled surface which so delights the eyes of some (though, personally, I prefer the matt surface we get on bromide paper). Let me recommend my fellow-amateurs to try it, and I promise them they will be charmed with it. I have just finished a large number of pictures on it from negatives I took this year in Norway, Sweden, and Denmark. They are mounted in an album in the order in which they were taken, and elicit the warmest expressions of approval from all who see them.

Changing Eastman Rolls.—I took with me to Norway, this year, an "Eastman Roll Holder," but unfortunately left my changing lamp behind. Consequently I experienced very considerable difficulty in changing the rolls in the dark, and I am afraid I lost my temper on one or two occasions while doing so. However, I met a fellow-amateur who very kindly lent me his lamp, and gave me also a tip about changing rolls, which is so simple and at the same time so good, that I reproduce it here for the benefit of those numerous amateurs and others who now use these roll-holders. It is this. On each end of the roll of sensitized paper gum a length—say about nine inches or so—of non-actinic paper, orange or yellow, then wind it tightly on the roller. With this arrangement you can open your roll-holder in broad daylight, and take out the exposed roll and insert a fresh one in its place, without the least fear of fogging any of the negatives; for the paper is so tightly rolled that the light can only affect the extreme edges of it, which is a matter of no importance, as there is a margin of a quarter of an inch each side, which is covered by the rabbet of the slide. I don't know who first discovered the dodge, but whoever he was he has the heart-felt gratitude of at least one of the noble army of martyrs in the cause of the camera.

HINTS TO LANTERN LECTURERS.

BY ANDREW PRINGLE.

To some people, the preparation and delivery of a lecture of any kind is a drudgery and an unmitigated nuisance altogether. Other people look upon it as rather a joke, and as a matter of little consequence, whether good, bad, or indifferent, so long as they scrape through without any serious hitch or complete break-down, or blow-up. For my own part, though I do not treat the matter so lightly as the latter persons, still I find a marked pleasure in lecturing, so long as my conscience tells me I have done my best to make the affair a success. "What is worth doing, is worth doing well," is a favourite motto with me, though I cannot always claim to act up to it. A lantern lecture is certainly worth doing well. A good lecture affords instruction and amusement to an audience, and good pictures on the screen must afford pleasure, and lead to elevation of taste. We *humans* are a gregarious lot, and we learn better, we enjoy better, in company than in solitude; hence the advantage of a lecture illustrated by lantern views—all hear at once, all see together, all learn together, all enjoy in company.

The first thing that occurs to me as likely to spoil a lecture is defect in the mechanical arrangements. The screen, for instance, must be a good one, clean, well stretched, and of a handsome size. The screen should never be folded otherwise than face inwards, and should never lie on a floor otherwise than face upwards; and the frame must be a good one, so that the screen can be stretched quite taut. Therefore the frame must not be too flimsy; portability is no doubt a consideration, but efficiency is paramount. As a rule, the screen has to be more or less canted; the less "belly" it takes in such cases the better for the definition, for the screen "bellies" the wrong way in nine cases out of ten. Therefore the screen must be fairly tight, which means that the frame must be fairly strong. If the screen and frame are furnished with a nice curtain to draw aside at the beginning of the lecture, the appearance is good, and a good appearance is of greater importance in the eyes of an audience than might be easily believed. So with the lantern itself. There is no necessity for, nor advantage in, a lantern ablaze with brass, nor do the pressure-boards require to be gold mounted, nor the jet jewelled in many holes, but the whole kit should be in good repair, clean, and business-like. I mention pressure-boards, but I infinitely prefer bottles when I can get them; they take up far less room, cannot be tampered with, and look ever so much more scientific, which is an important matter with most audiences.

I need not say that the whole affair must be in perfect working order. The jet must be fixed and lighted—not at full power, of course—the disc centred, and the first slide in its place and focussed, before the audience comes into the hall at all. The cap of the object lens must be on, and the operator at perfect ease, and not fidgetting or "fiddling" with the apparatus in any way. If bags are used, there ought to be a clear space of at least six feet all round, and a responsible person placed in charge of them. The weights must be tied on, and the boards have free play to subside as the gas is used. The lime must be very gradually heated to avoid cracking; I put mine into an oven when I have a chance. If the lime does crack, and requires to be changed, the operator can signal to the lecturer, who can explain the reason for the total eclipse: many people now-a-days are very nervous about the lime-light. It is best, however, if possible, to have an interval of a few minutes, turn up the gas in the hall, change the limes, and have a smoke—not too long, however; five minutes at the outside. If any new apparatus or part of apparatus is to be used, it is vital to have a trial beforehand: you never know what will be the effect of a change, however slight.

About the lecture itself I cannot say much; it must be suited to the audience—that is the main point—and it must be your best. Don't think that because it is only a lantern lecture that you can scrawl off any sort of froth. Remember that some very great men give lantern lectures, and that some of the most weighty truths have been communicated by this means. And why should it not be so? Is there any better method of illustrating facts, of communicating experiences, to a large body of persons at one time, than by the optical lantern? If there is, I am not acquainted with it.

No lecture should be "dry-as-dust" all through; we can get that sort of thing elsewhere. If there is in your composition the slightest spark of humour, unburden yourself of it in your lecture. And if, poor fellow! you have not the scintillation of fun, go to someone who has, and get him to relieve your monotony a little; and the earlier in your lecture you can let off some of your jokes—or your friend's—the better. I always try to blow off a little of my comical steam in my introductory address, by this means intending to put my audience in good humour from the very start. It frequently, very frequently, happens that on the perpetration of a pet joke a dead silence takes the place of the expected roar of laughter; this is awkward, but can't be helped—the only way is to go on, and hope for better luck when the next joke comes round.

In reading a lecture to a large audience, though natural gift of voice has much to do with audibility, still much may be done by care and practice. A loud voice is not so effective as clear, slow, and deliberate enunciation. In many halls a shout is worse than a whisper. While making my preliminary remarks, before the gas is turned down, I try various tones and pitches of voice; and, watching the faces of the audience close to me and farthest away, I soon find out the acoustic qualities of the hall.

No lecture ought in my opinion to last longer than ninety minutes, or one hundred at the most. However interesting the lecture or fine the slides, the prolonged darkness of the hall causes a feeling of monotony. If the audience were all paired into couples of sweethearts it might do well enough; but this is not always feasible. The ladies cannot see each other's bonnets, and the gentlemen cannot properly ogle the ladies. Though these matters are not essential parts of a lecture, they aid greatly the enjoyment of the audience, and must be allowed for; therefore let ninety minutes be the limit of time occupied. So far as possible, allow your good slides to remain long on the screen, but whip off the poorer ones as soon as the scenes are described. For signalling to the operator, you do not want an electric bell, or a gong, or a fog horn; a tap on your glass of water with your knife does quite well, or a flash of a coloured light in your reading lamp, if the operator happens to be watching. If anything goes wrong, KEEP COOL. If all goes well, KEEP COOL.

SOME STRAY NOTES.

BY S. H. E. SUTTON.

THERE is one peculiarity about gelatine dry plates that is very perplexing, and oftimes causes serious annoyance to the operator, and that is the differing behaviour of different batches, but especially those that have their origin from various manufacturers. When I speak of differing behaviour, I mean as regards their action under the influence of the solutions brought to bear upon them—the developer, the intensifier, and the reducer. When wet plates were in use, these difficulties were practically without existence. Whatsoever make of collodion was in requisition, the same formula for developer and intensifier was used without trouble and without any thought of modification; but under the new *régime* this is often a thing of the past. Ordinarily I use but two brands of plates, which, for convenience, we will call A and B. During the past summer I have used a quantity of both; those from A in two several batches, the first of which would not bear the developer according to the formula supplied with them, but gave splendid results when it was reduced to half the strength; the second batch were directly to the contrary, being comparatively worthless as regards printing quality until the developer was restored to its full strength. These are very awkward things, especially in a busy time, for it is not always that the fault is run to earth and laid bare after the first trial.

In intensifying, I noted that the two makes, Aa nd B (that is to say, from the two separate manufacturers), behaved in opposite directions. A gave good results with mercury, followed either with ammonia or sulphite of soda; B would only act when the mercurial treatment was followed with ammonia, sodic sulphite reducing the image to its former weakness, and the longer it remained in contact with the film the more it was reduced; so that really what in the case of brand A acted as an intensifier, in the case of brand B became a reducer. Similarly in the reduction of density, cupric chloride would reduce A almost to bare glass, ferricyanide of potassium still more effectively the same; but in the case of B scarely (if any) effect was noticeable under the action of cupric chloride. No wonder that we hear of such diverging experiences, or that one casts aside with disgust what another has recommended as a panacea for some grievous ill. I have had negatives completely ruined, both with ferricyanide of potassium and perchloride of iron, both of which have had their merits applauded as being the pink of perfection for reducing purposes. But then so it is that gelatine dry films in these respects remind one of the old adage: what is one man's meat is another man's poison.

It may be worth while to note that ferri-cyanide of potassium (of course in combination with hypo) is also recommended as a perfect reducing agent for silver prints, with the additional qualification that the tone of the proofs is not altered, as is the case when cyanide of potassium is used for that purpose. My experience of it has been contrary to this. Its action as a bleach is unquestionably perfect—more so, I think, than the cyanide. Proofs literally black, and others but slightly too dark, gave way under its influence, leaving the delicate half-tones in harmonious balance, but as blue in colour as any over-toned prints could possibly be.

Wrinkle No. 1.—I had two porcelain dishes which had pieces broken out of their sides, thus being rendered useless. I cemented them together carefully with gutta-percha, keeping the pieces in position until set, as they had a knack of sliding off. They have been in use to the present time, and seem to be practically as good as when new, notwithstanding that one of them is commonly used for holding silver solution.

Wrinkle No. 2.—I never find myself in any difficulty in the stripping of gelatine films. The most obdurate, under ordinary treatment in development and finishing, have given way with a little gentle coaxing after being placed in a strong bath of citric acid and chrome alum, with the acid in excess. In some instances, the films thus treated, when removed and placed under the tap, washed off the glass into the sink, as a collodion film was occasionally prone to do. But this very day I have in this manner stripped four negatives most successfully; and I may mention, as a singularity which I have not previously noticed, that in one case there was left upon the otherwise bare glass a perfect positive picture of the lady that had been photographed upon it, faintly visible by refraction, but clearly visible even in the half tones by reflected light. This I have preserved as a curiosity.

CHLORIDE OF GOLD: THE REAL AND THE FALSE.

BY A. P. LAURIE.

There is probably no article of commerce in which the cheating interest of the seller, and the guilelessness and desire for cheapness of the buyer, have been carried so far as in the matter of chloride of gold for the photographer.

This article, being the most expensive of all the chemicals the photographer purchases, and being therefore the one in which he should insist most of all on getting his money's worth, he does not even take the precautions that he would naturally observe in buying a pound of washing soda for a penny. He receives for his money a little bit of glass tube containing a yellow substance, which is understood to be 15 grains of chloride of gold, though even this weight is not always guaranteed by the seller of the article.

In most cases, however, a label declares that the tube does contain this amount of the salt, and the photographer goes away happy, and never thinks of testing the truth of this statement. Even if the tube does contain 15 grains of chloride of gold, this is no guarantee of the amount of metallic gold, as chloride of gold is not, unless carefully prepared, a definite substance, like, for instance, common salt or chloride of sodium, for it contains variable amounts of water and acid.

It is, further, a very simple matter for the manufacturer of the article to sell, in place of chloride of gold, a double-salt consisting of chloride of gold and chloride of sodium or potassium. In this way the purchaser is paying for common salt the price of gold, buying it for its weight in gold. I saw on a chloride of gold tube the other day the statement that the salt it contained was non-deliquescent; this was a very straight-forward declaration, on the part of the manufacturer, that the substance the tube contained was not chloride of gold at all. This matter of chloride of gold has reached a climax of absurdity when we actually have a firm advertising that they sell the article cheaper than any one else—so cheap, in fact, that if the salt contains a proper percentage of gold, the firm must lose heavily on every tube they sell, unless they have a private gold mine in the background. Even assuming the private gold mine, they are doing bad business, as they might sell the gold for more than their chloride of gold tubes. They seem to be doing a roaring trade, in spite of the fact that if their tubes contained the proper percentage of gold, a handsome profit would be made by buying the tube, recovering the gold, and selling it to the refiner. Can the mania for cheapness go further? It would be equally sensible to deal with a man who offered to sell sovereigns at a shilling each.

To put this matter to the test of figures, if chloride of gold contained no water, and consisted of gold and chlorine only, 15 grains would contain 9·7 grains of gold. The crystalline salt obtained by evaporating the solution in aqua regia contains 7·1 grains.

Contrast, now, with the above figures, the result of the analysis of a tube of chloride of gold supplied by a well-known and respectable firm. It contained 4·9 grains of gold. These figures speak for themselves, and it is evidently time that photographers took to some new method of buying their gold for toning purposes. They should insist on having a guarantee of the amount of metallic gold the tube contains, and if one of the photographic societies took the matter up, and had the chloride of gold tubes of a few makers analyzed by a competent analyst, and the results published, the photographic firms would soon find it to their interest to sell a genuine article. At present they can hardly be accused of cheating, as in most cases they are not even asked how much metallic gold the tube contains, but are simply asked for a cheaper article; and it is sufficiently obvious that the only way to sell cheap chloride of gold is to put in less gold.

AN EXCELLENT DEVELOPING LAMP.

BY THE REV. A. M. MACDONA.

I HAVE long been looking out for a really efficient developing lamp, which would combine the qualities of handiness, portability, brilliancy, and safety, and I have just discovered it. It is made as follows:—Get one of Clarke's Fairy Lamps, such as are advertised every day, which costs about half-a-crown; let the globe be of opal glass, and paint the white glass receptable below, in which the light rests, two or three times over, with a varnish made of aurine dissolved in spirit; then cut out of a sheet of golden fabric or yellow paper a piece which will go twice round the globe of the lamp, fasten this in the form of a tube by a couple of ordinary paper fasteners; it ought to be about nine inches deep, so as to reach a good way above the top of the lamp; then light the lamp and put on the globe, round this put the yellow tube, and your light is complete. The light which escapes at the top is insignificant, as the hole is small, but even this can be reflected yellow by fixing a little way above the lamp one of those small cardboard shades, seen in nearly all ironmonger shops, and painting the inside of it with aurine varnish. It gives abundance of light, is quite safe, and lasts for ten hours.

LOCAL FOG.

BY EDGAR CLIFTON.

With the introduction of paper negatives we were promised a total freedom from what has long been known as halation. This promise has not been entirely fulfilled, and the trouble now proves itself to be not merely halation proper—*i. e.*, reflection from the inner back surface of the glass—but a conjunction of evils, all more or less contributing to the formation of the unsightly white patches we are so familiar with in photographs of very unevenly lighted subjects. It may be fairly assumed that with negative films or properly backed plates, halation proper is almost, if not entirely, eliminated, so that we must seek further for the causes which produce the effect which is so like halation, but which is not, as we understand the term, halation at all.

Local over-exposure is one of the greatest of these causes, and we have, fortunately, a means of both identifying and removing its effect by the use of the now well-known process of rubbing down the over-exposed portions with a rag or leather moistened with methylated spirit. Layer by layer the superfluous silver is rubbed away, and at last the details of the image appear with almost the brightness of a properly-exposed picture. With halation the case is totally different.

Here the fog is on the back of the film, and the rubbing away process only results in weakening the image proper, and leaving the fog in *statu quo*. However, with an unbacked plate where halation is present, so is usually local over-exposure, so that here the rubbing-down process is useful in diminishing the thickness to be printed through, although we must not expect to obtain such a bright picture as in the first case mentioned.

Another little-recognized cause of local fog is the presence of light-reflecting particles in the atmosphere, so well exemplified in a sunbeam in a dusty room. From a truthful as well as an artistic point of view this can hardly be regarded as a defect, except that the effect always seems stronger in the photograph than in nature, so that it has to be subdued by "dodging" in the printing.

One more hint, so well worn that the writer is almost afraid to tender it again. Be on the look out for reflections from the inside of the camera and lens, and beware of cracks which may have developed themselves in the woodwork since your last inspection. Cameras, like all other earthly things, are liable to change, and the writer has spoiled more than one picture through an unsuspected and almost invisible crack in the rising front.

NON-EXPOSED GELATINE PLATES.

BY THOS. GULLIVER.

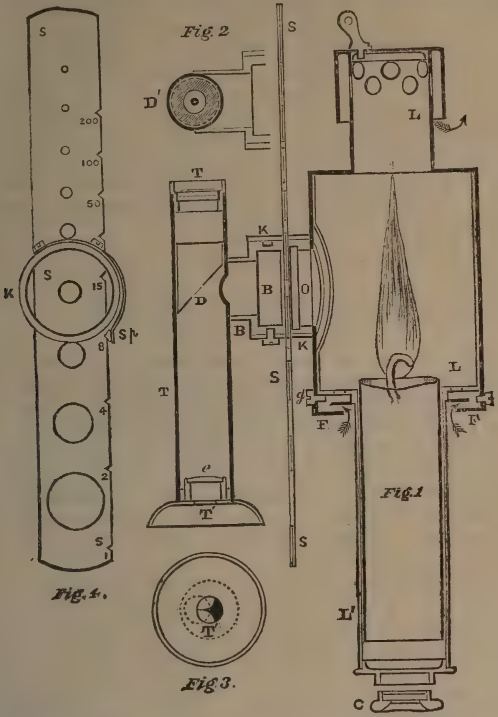
Part of my photographic business lately has been the developing and printing from amateurs' plates, and I have frequently found plates exposed twice over, and a corresponding number not exposed at all. These last I have been able to use over again by merely well washing them, and draining them on an ordinary rack. Then putting them into a dark cupboard where they remain for a day or so, and they are again fit for use. They are slightly stained with the pyro solution, but, with a little longer exposure, give just as good a negative as before. Sometimes I have seen a metallic border round the edge, but it does not interfere with the printing qualities of the negative.

TAYLOR'S PHOTOMETER FOR ESTIMATING EXPOSURES.

This photometer is intended to measure the brightness of the darkest visible details, or shadow details of the subject to be photographed, and thus to yield a direct clue to the proper exposure. It is thus used according to the guiding principle ruling in exposures—viz., that the exposures should be adapted to the shadows of the subject, neither being too short to allow the shadow details to imprint themselves, nor (as a rule) longer than is necessary for the same details to imprint themselves distinctly.

The light of a standard Parliamentary sperm candle is used as a light for reference. The candle is enclosed in a light metal lamp, L L L, which is provided with arrangements for enabling the candle to be easily lighted or extinguished, and when closed it is light-tight. The candle illuminates a disc of opal glass, O, placed within a short branch-tube, K K, affixed to the outer casing of the lamp. A metal slide, S S (see also fig. 4), perforated by a series of graduated apertures, slides through a slot in K K, just in front of the opal disc, Q. A hollow socket, B B, rotates stiffly within the remaining part of K K, and bears, fixed at right angles to it, the observing tube, T T T. The light from O shines into the tube T T′, and illuminates a white ring painted upon a diagonal diaphragm, D, this diaphragm being perforated in the centre of the white ring by a small hole. Fig. 2 is a view of the perforated diagonal diaphragm, D, when viewed from the eye-end, T′, of the tube, T T′. The white ring, with the hole in its centre, is viewed through a lens (*e*) in the eye-end, T′, which ensures distinct vision of the white ring, &c. A cap, containing blue glass, is screwed into the other end, T, of the tube, T T.

The object of the diaphragm slide, S S, is to limit the area of the illuminated disc, O, allowed to shine upon D. The apertures in S S are numbered or figured in inverse ratio to their areas, the largest being



No. 1, and the aperture having $\frac{1}{30}$ of the area of No. 1 being figured 30, and so on.

The readings are taken near the point of the detent spring (*s p*) fig. 4. Thus in fig. 4 the reading is 8. If the candle is burning, and the lamp held upright, and the observing tube T T′ is directed to any luminous object, then the eye placed at T′ will see a luminous white ring surrounding a spot of blue light. If the diaphragm-slide, S S, is pushed up or down, the brightness of the white ring will vary, and can be made to match in brilliancy (more or less exactly) the blue spot of light. The aperture in S S, which is figured 50, will evidently illuminate the white ring with just one-fiftieth of the intensity with which aperture No. 1 will illuminate it. Therefore, if the use of aperture No. 1 is necessary to balance the brightness of the blue spot upon one occasion, and the use of aperture No. 30 is required to balance the blue upon another occasion, then it follows that, in the latter case, the brightness of the blue spot of light is just one-thirtieth of its brightness in the former case. But the blue spot of light reaches the eye directly from that part of the subject to which the observing tube T T′ is directed, and if it is found that an exposure of one second is necessary to just imprint on a plate the details to which T T′ was directed in the first instance above supposed, then an exposure of 30 seconds would be necessary for effecting the same in the second instance—that is, supposing that the rapidity of lens and of plate is the same in both instances. If a reading of 1 indicates an exposure of 3 seconds, then a reading of 100 indicates an exposure of 300 seconds, a reading of 8 an exposure of 24 seconds, and so on.

A HINT TO RETOUCHERS.

BY ANDREW BOWMAN.

MINUTE and delicate retouching on the surface of negatives is best effected with the aid of a long fine-pointed hard lead pencil, "preferably Faber's leads in holders," and most retouchers will have found, from sad experience, that a great deal of their time and nearly the whole of the material is wasted (partly by breakage) in the process of sharpening their pencils with a pocket-knife, which few take sufficient care to maintain in that nice order so necessary for the delicate operation of pointing a retoucher's pencil. Those who have not already hit upon the following mode of pointing a pencil will find it easy, expeditious, and economical.

Procure two gritstones, such as mowers use for whetting their scythes, one of them very coarse in the grain, and the other fine. Get the faces of the two stones ground perfectly flat. Have the edges of the coarse stone rounded a little, so that its rough particles may not catch the lead too eagerly, and possibly snap it short off by the end of the holder.

To put a fine point on a new lead, bring it out of the holder a little bit at a time, and grind it by passing the lead from your right to left along the face of the coarse stone, at the same time rotating the holder between the fingers and thumb, and drawing it slightly towards the body. After nearly 1¼ inches of it in length has in this way been sufficiently reduced by grinding on the surface of the rough stone, finish the operation on the smoother one.

By this means a pencil can be very speedily ground to a point as sharp as a needle. Set up in this way, with care, the retoucher may work with it for a couple of days or more without having recourse to the rough stone to grind it further back. The grain of the stones never gets clogged with lead through use, unless some adhesive substance has come in contact with their surface, in which case they can easily be cleaned by rubbing the faces of the two stones together in water.

PLATT'S CARBONATE DEVELOPER.

BY MAJOR C. D. DURNFORD.

I FEEL somewhat loth to recur to the never-ending new developer subject, especially as I believe that, in the majority of cases, the best developer in the world is the one that you are used to, whatever that may be. I do recur to it, however, as I am sure that good will be done by drawing attention as much as possible to a form of developer recommended by Mr. Harry Platt (Nantucket, U.S.A.), in the YEAR-BOOK, 1886, which possesses certain advantages not obtainable by most of those published. By this I mean that it gives a very simple means of humouring the quality of a negative in any desired direction, and unusual power of successfully dealing with imperfect exposure.

Mr. Platt, speaking in a controversy on scientific development, states that he considers it the most powerful and also the most scientific developer made. Of this I am not qualified to judge, but it is unundoubtedly strong in the qualities mentioned above. The formula—

Pyrogallic acid	dry

Or, if preferred in solution, the following is recommended—

Water...	10 ounces
Sulphite of soda (crystals)	2 ,,

Dissolve, test with blue litmus paper, and if it does not turn slightly red, add sulphuric acid, drop by drop, until it does; then add—

Pyrogallic acid	1 ounce
Water to make up	16 ounces

Each drachm will then contain 3½ grains of pyro. For the alkaline solution make three as follows:—

A.—*Soda Solution.*

Carbonate of soda (dried to a white powder) ...	13 drachms
Sulphite of soda (crystals)	6½ ,,
Water...	8 ounces

B.—*Potash Solution.*

Carbonate of potash (granulated)	13 drachms
Sulphite of soda (crystals)	6½ ,,
Water	8 ounces

C.

A.	4 ounces	mix
B.	4 ,,	

This will keep any length of time.

To develop an average English plate 8½ by 6½, of proper exposure, take—

Pyro	5 grains	(more or less, according to make of plate)
Water	3 ounces	

Soak the plate for a few seconds in this, then add of—

Solution C	60 minims

But if the plate is known to be over-exposed, or if there is any doubt, begin with half the quantity of C, or even less; or a restrainer may be used, if preferred, consisting of bromide of potassium 15 grains solution. For under-exposure, begin with up to 120 or 140 minims, according to the case. The image should begin to appear in half a minute. If it does not do so, add C gradually until it does; it should then build up without further trouble. I must add that the quantities given above of the developer to be used are not Mr. Platt's, who confines himself to more general direction, necessitating a slight amount of experiment. I have added the figures to the best of my ability, in order to give beginners, should any care to try it, an easier starting point.

We now come to the object of the separate solutions, A and B, in using which, remember that soda (A) alone makes a negative strong in contrasts, and somewhat weak in detail. Potash (B) alone makes a thin negative very full of detail. The two together (C) produce the most harmonious results, and are sufficient for the majority of subjects. If, therefore, the picture to be taken lacks contrast, begin development with an extra dash of A; if, on the other hand, there are violent contrasts, or much white drapery, increase the potash. If, during development, the high lights are outstripping the detail, add very little B.

Since writing the above I see that the carbonate developer has recently been strongly recommended by M. Roger in the *Bulletin de la Société Francaise de Photographie.* His proportions are somewhat similar to Mr. Pratt's for proper exposure, but he keeps his sodic sulphite in a separate saturated solution, varying the proportion used for imperfect exposure, as well as that of the carbonates.

IDENTIFICATION BY PHOTOGRAPHY IN ITS RELATION TO MEDICAL JURISPRUDENCE.

BY WILLIAM MATHEWS.

THERE is ample room for a careful treatise upon that item of medical jurisprudence which deals with personal identification. The minute accuracy of photography in its reproduction of details and of relative areas justifies the conclusion that it is competent to furnish unerring data and unimpeachable results. Yet, until this very hour, the text-books that do duty in our medical colleges either omit all allusion to the topic, or are lamentably misleading in their tuition. Expedients wholly unreliable, and commentaries entirely without foundation, have been pushed to the front, ostensibly for the edification of confiding students, yet really to the postponement of judicial equity.

There is space in these columns for but a very summary dealing with the subject. Let it suffice to indicate what to the writer seems the natural order of development of the points calling for attention, and which would serve duly to marshal the array of facts that await consideration.

Once for all, it is much to be desired that there were set forth in a consecutive manner the following particulars.

I. *The Factors of Similarity and Diversity Physiologically Considered.* —Under this heading would rank (1) an examination of the several items which make for the production of given types of countenance; and (2) of those minor "varients," which operate to diversify, infinitely, even the most persistent typical peculiarities, and which afford the means, to an unlimited extent, of distinguishing one countenance from another.

II. *The Photographic Conditions Essential to Successful Identification.*—This section would necessarily include a recapitulation of those requirements which are found to subsist, and demand compliance, between the separate photographs subjected to investigation. This topic would also concern itself with the various particulars of magnitude, of differing or averted aspect, and of pose, with their remedial possibilities, when available; and with the geometric formulary by which these particulars can be minutely verified.

III. *Historic Failures in Identification by Portraiture.*—This chapter would be full of incident. It would be chiefly concerned, however, in pointing out the inherent weakness of the "look and say" method, and of the insufficiency of the pseudo-scientific method recently elevated into temporary dignity in the pages of a popular text-book of medical jurisprudence. Thus would the atmosphere be sufficiently cleared for entering intelligently into the details of that process by which portraiture may be scientifically and crucially superposed and tested.

IV. *The Theory of Composite Portraiture.*—Under this section would be duly discussed the various methods which have been at length evoked by the experiments of some, and by the "inner consciousness" of others, for the veritable combination of either two or ten, or, if you will, twenty or more portraits. The true intent in such cases has been either that of noting the *differentia* in given instances, or else of merging into a central outcome all the points in common of a whole series. These extended and still extending experiments would or should in the end lead up to the satisfactory solution of the main interrogatories of jurisprudence. It may be, therefore, not too sanguine to anticipate the ultimate recognition and adoption—as the latest word upon the subject—of the "theory of the dominant."

V. *The Determination of Identity by the Evolution of the Dominant.*—It will be sufficient here to point out in general terms the nature of the theory as a method of identification. And a familiar illustration may, perhaps, better suffice to make plain the principle.

Let us assume, then, for the present purpose, that there are seven (there are several beside) factors of diversity in the longitudinal diameter of the countenance. Let us thereupon devise a simple experiment that may operate as a test. A disc of paper, moderately opaque, should be pierced with seven slits or openings, representing respectively, (1) the depth of the forehead, (2) the distance between the eyes, (3) the length of the nose, (4) the wings of the nostrils,

(5) the place of the mouth, (6) the depth of the chin, and (7) the diameter in its entirety. Of these discs there should be (say) ten; the greater number differing more or less among themselves. But in three instances and no more, the slots shall be identical. Let these discs be then symmetrically superposed and pivoted, by the agency of slots (2), and in any desired order of succession. It results, that upon being now exposed to a sufficiency of light, the only parts of the near disc that will be fully and sharply illuminated will be those at which, by the agency of the three interpolated discs, the light shall have been admitted in the maximum degree. Thus, the interpolated discs, being identical, will be seen to assert themselves as the dominant factors.

Further to dilate or to explain is here impossible. But it is permissible to anticipate that, in the development of the above exemplar, the intelligent reader will be willing to admit, we have, in truth, an exact rescript of that procedure and result which would similarly take effect if, into a group of photographs, there were similarly interpolated certain debateable portraits, which had hitherto been justifiably held to be judicially indecisive, yet which were, nevertheless, in point of fact, identical. In such case, identity and identity alone, could eventuate, and it would suffice to eventuate, their preponderance, and to establish them as the true factors of the dominant of the series. Judgment—which previously to the interpolation, had held the balance in suspense—by the agency of the interpolation would forthwith be furnished with the unimpeachable data of a correct decision.

HINTS TO TOURIST AMATEURS.

BY ROBT. DAVIES.

THE few words of advice I have ventured to offer below, all of which are the result of my own experience, are not addressed to the fraternity of professional or experienced photographers, but are simply intended for the use of those tourists who, with a knowledge of the art without a varied experience, are desirous of bringing back with them from their summer or other trips a few pleasant mementoes of the scenes through which they have passed. It has been my custom for some years past to fix myself in head-quarters—*i.e.*, to take lodgings in some picturesque and healthy locality, say in the Highlands of Scotland, or among the English Lakes. There I set up my developing tent. This has already done good service, as it holds in travelling all my dry plates and my developer, and has sometimes even carried printing frames and paper; in fact, I have never found it in any way an encumbrance. In it I develop the plates which have been taken from day to day, and many a time on a wet day, when nothing could be done in photography except developing, and probably nothing else whatever in any other occupation of life, the tent has been an absolute godsend as a relief to the ennui and misery of watching hour after hour, and perhaps day after day, the ceaseless rain driving through the valleys, and the endless clouds settling on the mountains. I may add, as another hint, take all chemicals dry, as they can be mixed up on your arrival at your destination. I find the ordinary soda (in domestic use) developer the best, and as that commodity can be procured anywhere, it is so much the less weight to carry.

I tried paper and film negative taking this season, but soon threw it up, and returned to glass; the constant need of oiling, and the impossibility in several instances of removing the grain entirely from the paper, made it very unremunerative. Lately, however, a new support for bromide emulsion has appeared in the market. It has already been rendered translucent, and as soon as the makers can see their way to bring their prices down to something near the average of those of the dry plate makers, I shall try it, the price at present being almost prohibitive.

Never go out for a holiday without taking one of Oppenshaw's or Burton's note books, and when you have one, see that you use it.

If glass dry plates are used, always back them; the process is easy, and one dozen can be so treated in less than twenty minutes.

If you have to wait one, or even two hours, for the proper lighting of a view, do it; you are always repaid for the apparent loss of time by the resulting negative.

Never promise a certain picture to anyone, as you cannot be sure what accident may happen to it before it is finished.

A simple drop-shutter will be found to be the best all-round shutter.

For general work a single view-lens will be found to be the best. Drop-shutter sea-scapes can be most successfully used with those working at $\frac{f}{14}$ or $\frac{f}{16}$; the resulting picture with a single lens is more brilliant than one taken with a double-lens.

Do not attempt instantaneous views or portraits until the art of developing properly has been in a way mastered. Do not use the fixing hypo too often. Always use chrome alum and citric or hydrochloric acid after fixing; it hardens and clears the film, and also renders it insoluble.

The above hints, if addressed to "Old Hands," might have come under that supererogatory class of advice proverbially typified by the instruction given to our grandmothers in the art of sucking eggs; but, as I have already said, they are only addressed to beginners, or to those whose practice of the art is merely occasional, and to such I have reason to believe they may not be useless.

NEW DARK ROOM LANTERN.

BY F. C. BEACH.

The principle of this lantern is based somewhat on a pattern which I recently saw, where electricity is used instead of gas.

The electric lamp was suspended inside of a large tin funnel, the mouth of which was covered by non-actinic paper or cloth. When the funnel was suspended by its tube the light was projected downward. To accomplish a similar result with gas is the object of this improvement. Fig. 1 is a perspective view of the lantern as hung ready for operation. Fig. 2 is a horizontal section midway between the burners and top, through the line *y y* of Fig. 3. Fig. 3 is a vertical sectional elevation. Fig. 4 is a plan view of the burners.

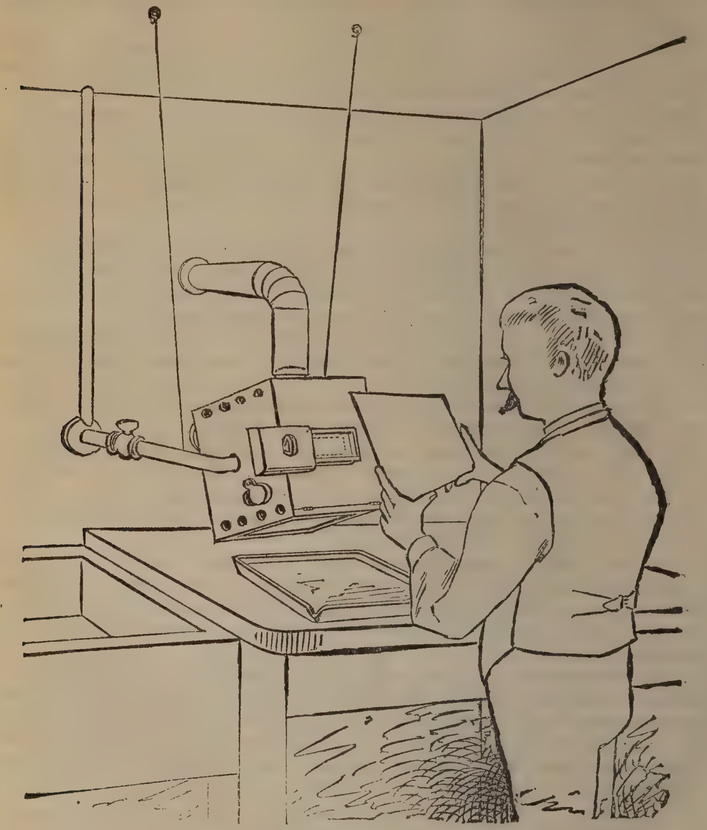


Fig. 1.

The lantern consists of a Russia iron box, twelve inches square, having a six inch in diameter exit at the top, and an open bottom, closed by two panes of glass (one of cathedral green, the other of cathedral orange, with yellow tissue paper between them), as clearly shown in fig. 3. Metal grooves or ears are riveted to the sides near the bottom, permitting the panes of glass to be removed at pleasure for cleaning or for inserting other colors of glass. A long hinged door shown at the bottom of the front (fig. 1) covers the space occupied by the glass. Half-inch holes are punched through the sides and back at short intervals, near the top and bottom, which are protected on the inside by L-shaped light protecters extending the entire length of each side, and are riveted thereto (see figs. 1 and 3). These apertures admit a free inflow of air, and supply oxygen to the gas.

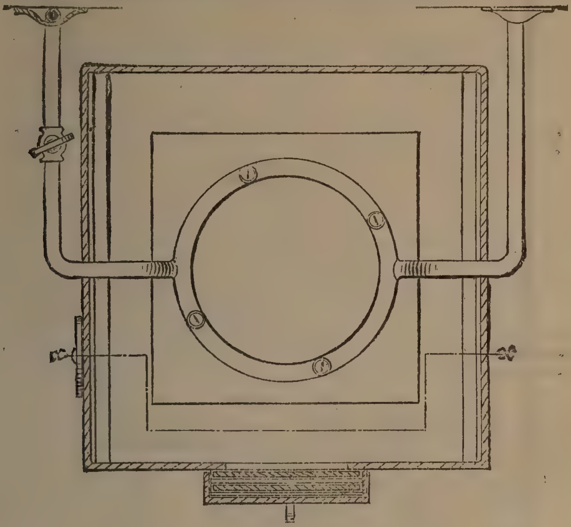


Fig. 2.

On the front of the lantern is a small window 4 by 5 inches protected by a metal slide (see it partly withdrawn in fig 1), in which are fixed two panes of green and orange glass like the bottom, held in grooves, and removable at pleasure. On the left hand side (see fig. 1) is a small aperture one and a-half inches in diameter, covered by a pivoted metal slide, through which the taper is inserted for lighting the gas.

The gas pipe projects horizontally from the wall (fig. 1), and is screwed by means of a union joint to the gas ring, made of hard brass, and hard soldered, the circle being about four inches in diameter, having four jets (figs. 2 and 3), which is placed in the interior of the box about six inches from the bottom. A faucet in the pipe outside enables the operator to regulate the gas supply. From the gas ring suspended by wires is a square sheet of transparent mica, which protects the glass below from the downward radiation of heat (see figs. 2 and 3) and from cracking. From the top runs a six inch smoke pipe to the chimney (see fig. 1).

Three of these lanterns have been in successful operation for some time in the spacious dark room of the New York Society of Amateur Photographers, and give universal satisfaction. The burners are placed vertically on the gas ring (as in fig. 3), but the horizontal position (as shown in fig. 4) is preferred, since it permits the full effect of the light to be thrown downward without casting a shadow.

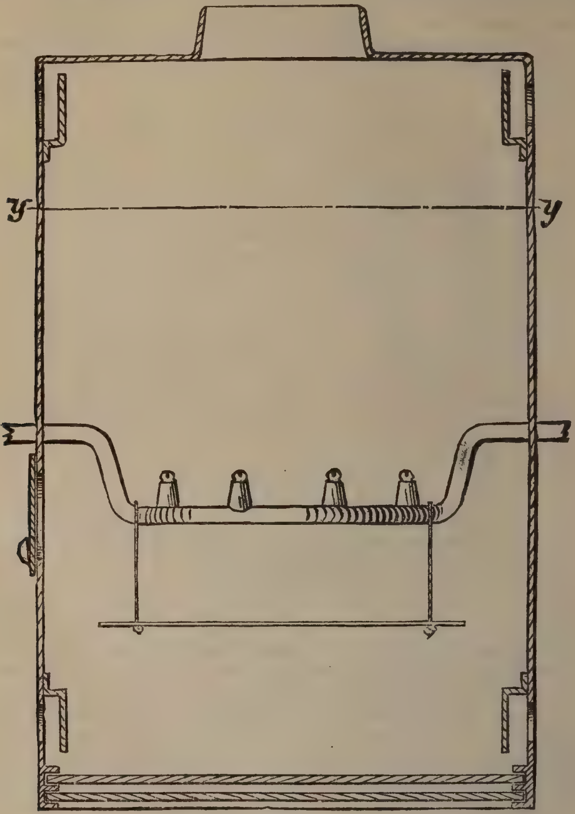


Fig. 3.

The lantern is slightly tilted (as shown in fig. 1) for throwing the light downward and forward, and enables the operator to readily examine the plate by transmitted light as to density when the metal slide is withdrawn from in front of the window. In operating, the slide covers the window, thereby preventing the light from coming in the eyes.

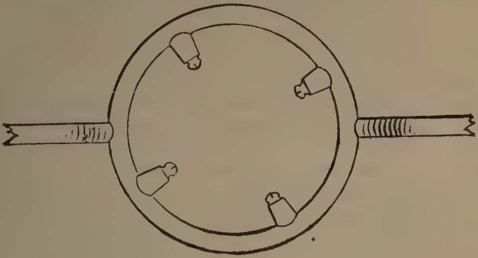


Fig. 4.

The advantages of the lantern are, that it promotes ventilation in the dark room by conducting the heat and gases directly to the chimney, throws the light downward directly where it is most wanted on to the developing tray, is perfectly under control, and protects the eyes, permitting one to watch perfectly every stage of development

DOUBLE OXALATE OF POTASSIUM AND IRON.

A. FREYER EVANS.

A NOVEL idea that struck me a few months ago, and which, I think, will be of great service to photographers generally, who dabble, as I do, in the iron salts, was the precipitation of the double oxalate of potassium and iron by alcohol. Now whether this has been discovered before, or not, I am totally at a loss to find out; but notwithstanding this difficulty I shall at present claim its discovery.

Before I enter into detail of this new departure I shall, for simplicity's sake, commence with the deportment of the various chemical bodies that are herein considered.

The mustard-coloured powder, ferrous-oxalate, we know, is almost insoluble in water, hot or cold, insoluble in alcohol, and soluble in a hot or cold solution of a soluble oxalate, which forms the abnormal developer, double oxalate of iron and potassium, symbolized as $K_2Fe(C_2O_4)_2$.

The canary-coloured crystals of ferric-oxalate are easily soluble in water, soluble in alcohol, and decomposed on exposure to the discordant oscillations of the blue-violet rays, swinging off its component molecule of carbonic anhydride, whilst the resultant residue of ferrous-oxalate remains *in situ.*

Potassium oxalate is well known amongst photographers as a pearly white crystalline solid, soluble in three times its weight of water, and only sparingly so in alcohol. If, to its solution, be added a saturated solution of ferrous-sulphate, in the proportions of 4 to 1, the latter portion of iron-salt being added to the potassium oxalate (not *vice versa*), the normal strength developer is formed. It will be seen that the porions printed in *italics* constitute the foundation upon which I build my research.

To more lucidly illustrate my ideas, we have (say) a mixture of ferrous and ferric-oxalates in potassium oxalate—*i. e.*, a spent sample of developer; to this add, cautiously, a quantity of methylic alcohol (free from dissolved gums or resins) until a separation of the liquids has been effected, which may be seen by the gravitating of small spherical tears to the bottom of the containing vessel. I have frequently repeated this experiment for the sole purpose of watching these little globules through a lens, and have afterwards thought it would have fine effect upon a screen, projected by means of a lantern; all that would be required is a tank (which every scientific lanternist has), a pipette, and the solutions named above. The re-action that ensues is this: Ferric oxalate being soluble in alcohol (ferrous not), and potassium oxalate only very sparingly, then, when alcohol is added to such a mixture of bodies, of course a separation of ferric oxalate from the remaining insoluble and precipitated double oxalate takes place, and by one or two rinsings in alcohol the latter remains at the bottom of the vessel chemically pure, and may be preserved for years intact beneath a supernatant layer of alcohol.

These small globules, whether by self-attraction or from their specific weight, amalgamate with one another, forming one mass of a ruby-red colour, which, upon the addition of more spirit, assumes a crystalline mass at the bottom of the vessel, by the abstraction of water, which is easily soluble again in water, and forms a ruby solution of the double oxalate. The practical method I adopt is as follows:—Dissolve ferrous oxalate in a bottle filled to the stopper with a saturated solution of potassium oxalate, by leaving in contact for twenty-four hours; pour off the supernatant fluid (which should be of a deep ruby colour) into a bottle holding twice its bulk, add methylated spirit (say $\frac{3}{4}$ ounce to every ounce of developer) to effect precipitation, rinse out with two or three changes of fresh spirit, and finally cover with a layer of the latter to protect it from oxidation.

To develop a plate I take about a teaspoonful in bulk of this precipitated iron-salt, and dissolve it in tepid water by stirring with a glass rod, until an almost saturated solution is attained, when, after standing for a few minutes undisturbed, the clear supernatant fluid may be poured into the developing dish, and used as an ordinary developer.

I may here note, that it being free from ferric oxalate and potassium sulphate, an increased amplitude in energy is attained, the two bodies here noted being retarders of development.

One would little think that ferrous oxalate, prepared by such a careful mode as above dealt with, contains ferric oxalate before its separation by alcohol ; but upon standing, the alcohol used will be seen to contain crystals of this yellowish green salt. I find that the double oxalate reduces, from solutions gold and silver, in the form of finely divided metallic particles, thus corroborating its identity with developers of this specific order. Its deportment with thiocyanate and acetate of ammonia respectively show its non-contamination with ferric oxalate, and finally it develops a gelatino-bromide plate in perfect detail and brilliancy, giving (to my mind) to the half-tones greater delicacy than hitherto achieved by any of the other iron developers.

Has there yet a method been published by which we can preserve chemically pure our pet developer from oxidation and conversion to the corresponding ferric state for such an indefinite period? I doubt it. How useful, when touring, to have your bottle of condensed double oxalate, so well preserved, so ready for use, and being absolutely free from that destroyer of latent, images, *Ferric Oxalate.*

MAKING THE BEST OF A BAD DAY.

BY RICHARD KEENE.

I SUPPOSE we ought not to expect much photographic weather in the month of November, but the morning of the third shone out so gloriously, and gave promise of so lovely a day, that two of us set out with a dozen plates to execute a commission of long standing. After a short railway ride and a walk through pleasant upland fields with extensive prospects over the Trent valley, stretching away into the dim distance—here and there a church spire, a village, or a lone farmhouse—we came to a little hamlet nestling among the trees at the foot of the hill we had journeyed over. During our walk the sun shone brightly, glorifying the landscape, and bringing out the gorgeous colours of the trees; but, alas ! we had scarcely reached the bottom of the hill when the cold clouds of November put a very different aspect on the scene. In the hamlet itself lay another disappointment, for seven or eight years ago it was all that a painter or photographer could wish, and yet I had never found time to take my camera there ; now, we found the builder (or destroyer) had been at work—the old public-house and two or three cottages had disappeared, and were replaced with new ones, ugly in themselves, and quite out of harmony with their picturesque surroundings. However, some bits still remained, and we consoled ourselves with taking a couple of them as well as we could in the dull light ; and then the rain came on. We still had a mile to walk to the next village, our destination, where we were to take views of the hall and the church. The wind had risen and the rain came down plentifully, so all chance of outdoor work was gone by the time we got there. Regretting we could not take some of the pretty views and sweetly rural scenes, we found our way into the church by the little doorway in the tower, where some workmen were busy re-hanging the bells ; and here we thought of staying till the storm was over. We did stay three mortal hours in the cold, windy place, and, like Mark Tapley, tried to be jolly. There were plenty of inscriptions telling of the pride of past generations, some still older monuments and incised slabs, partly worn away by the rustic feet of those sleeping in "God's acre" outside. We looked over these mouldering mementos of the dead, and inwardly cried—*Omnia vanitas!* Then we examined the building itself, dating from the days of the Conqueror, but mostly rebuilt in the Decorated style of architecture, and again re-roofed in the last days of the Gothic period. A beautiful roof it is, of good Perpendicular work, with handsome bosses and richly-moulded beams. Later on, in the days of Queen Anne, the chancel arch was filled up from the top of the handsomely-carved rood-screen, blotting out the greater part of the East window. This was done apparently to give a conspicuous place wherein to show the loyalty of the times; for here, in low relief plaster-work and richly emblazoned, are the Lion and the Unicorn a-fighting for the Crown, over the Creed, the Lord's Prayer, and the Ten Commandments. Some ugly blue curtains are painted above all, and are tied back by stiff pink bows! All these and many other particulars we noted. We then set our camera to work on a general view of the interior, and again another from the hideous gallery which blocks up the tower arch, and where is perched a wheezy little organ, giving our "instantaneous" plates an hour each—and then not over-exposed. It was a shivery sort of work, but we made ourselves as comfortable as we could in one of the high-backed pews in our top-coats with our handkerchiefs over our heads, for the wind held high carnival inside as well as outside the building. We listened to the rain beating on the clerestory windows, and shivered. Now and then we would get up and shake ourselves and sally out down the dismal aisle to inspect some new architectural feature of the building, and argue about its date or what not, but there was no heat in the argument. Then one of us tried a pipe in the porch, for one could not offer incense inside a church in these Protestant days; but there it was windier and colder still. Our two plates were at last exposed, and yet we had a lot of time on our hands before the train started, so we put another plate on a beautiful altar-tomb on which rested the effigies of a lady dressed in the costume of the 14th century, her pillow supported by angels. The legend around the tomb is almost obliterated, and the figures surrounding the sides much mutilated, but it is still a beautiful object. A much shorter exposure sufficed for this picture, and then we packed up our traps and set our faces homewards. The wind was as rough as ever, and down came the pelting rain in our faces, for we could not put up our umbrellas in such a tempest. However, a good dinner at the village, before we got in the train for home, added to our comfort, and passed the time away more pleasantly. We developed our five plates the same evening, and were then satisfied, for "blessed is he that expecteth nothing." We were not disappointed, having made the best of a bad day.

ALKALINE GOLD TONING.

BY JOHN SPILLER, F.C.S.

I NEVER could see the advantage of employing the phosphate of soda as a material for overcoming the acidity of a gold toning bath. It has often been recommended for that purpose, and there may be some occult value attaching to the use of this mildly alkaline salt which I have failed to discover in the course of my limited experience with it. However, I happened to light upon a rather curious observation, which tends to raise a question as to its permanent character when long kept in solution and exposed to the atmosphere. I had occasion to add hydrochloric acid to an old solution of this phosphate, and found that it effervesced like a carbonate, but on testing the dry salt in stock no such effect was observed. Could this be due to absorption of carbonic acid from the air, or was my ancient solution originally impure?

As I could have no proof of the latter, I put a newly-made solution of pure phosphate of soda to the test, and passed a current of carbonic acid through it. After a time the solution effervesced on adding a strong acid; so that I think it very possible that the soda in the ordinary disodic phosphate divides itself between the two acids, forming a bicarbonate and mono-sodic phosphate, thus—

$$Na_2\,HPO_4 + CO_2 + H_2O = NaHCO_3 + NaH_2PO_4.$$

Perhaps long contact with lead glass had something to do with it. But, whichever way we look at the reaction, the element of change is there, and one is tempted to ask, why not employ at once the carbonate of soda in our gold-toning baths, or rest satisfied with acetate of soda or borax, neither of which is subject to this change? I say, then, steer clear of phosphate, and take by preference a more permanent salt.

ON THE IMPORTANCE OF A LIBERAL SUPPLY OF GOLD IN TONING.

BY VALENTINE BLANCHARD.

THE experience of every photographer is alike in confirming the opinion that photographic prints on albumenised paper were formerly more permanent than they are at present, and various theories have from time to time been brought forward to account for it. But the most reasonable of them all appears to be that of Mr. W. K. Burton, in which he insists upon a sufficient and proper deposit of gold.

Some recent experiments are so confirmatory of his opinion that I proceed to give them for the benefit of all those interested in the question. I first strengthened up an old lime bath with a fresh supply of gold, and made, besides, a new lime bath with boiling water in the usual way, using six ounces of boiling water to the grain of gold, about a drachm of common whitening, and one drop of a saturated solution of chloride of lime. As soon as the solution had cooled down to a little below blood heat, I poured from the sediment into a toning dish. The old bath was in capital condition, and was toning at a comfortable rate when I commenced the comparative experiments. Four prints were taken from the batch in hand, and marked on the back for easy identification, and two were soaked in a strong solution of salt, and then were washed in two or three changes of water. These were put into the new lime bath, and the other two, washed in the ordinary way, were placed in the old bath. By the time the prints were toned in the old bath, those treated with salt in the new bath had scarcely changed colour. I took one of the prints from the old bath when toned to usual purple brown, but toned the other to a slatey grey. By this time the prints in the new bath had changed a little, but had not got beyond a reddish brown. In about ten minutes there was a suggestion of purple brown. I carried the toning a little further until the purple was a little more evident, but the brown tone still predominated. The four pictures were now fixed with the rest of the pictures, and washed in the usual way. These four pictures were picked out, when washed sufficiently, and were then cut in half.

One set was immersed in a bath composed of four drops of sulphide of ammonium to a pint of water. In a very short time there was a marked difference in the appearance of the prints. The one toned in the old bath to the usual purple brown in a very short time put on the sickly hue only too well known in faded prints. The other, toned to slate colour, resisted for some time, but finally took the cheese colour in the high lights. The other two pieces, treated with salt, and toned with difficulty in the new bath, became much greyer, but did not, even after a much longer immersion, put on the sickly appearance of the others.

The other halves were now put into a solution of bichlorate of mercury. After a little time the print, toned to the usual depth in the old bath, sensibly grew lighter, and put on the pink tint produced by mercury. The slate-toned print resisted much longer, and did not bleach to the same extent, and the warm tone imparted by the mercury very much improved its appearance. The two prints, treated with salt and toned in the new bath, put on a slight pink tint over the brown, but did not bleach at all, except at the edges, where, by keeping them for some time out of the solution, the toning had not been carried so far.

Now for the moral to be drawn from these experiments. If gold could be entirely substituted for silver we should hear no more of faded prints. This is clearly shown in the burning-in processes, where gold and platinum are substituted for silver in the image. A collodion transparency is made, and the film is detached from the glass, and in the toning operation with gold and platinum it is not enough to change the front of the film into purple, for the toning or substitution operation is not complete until this colour penetrates the entire film, and is equally strong on the back as in the front. If this substitution of gold and platinum for silver is not thoroughly accomplished, and any silver is left in the film, the colour of the image on the enamel after the process of burning-in at once betrays; for instead of the beautiful purple-grey that should be there, a disagreeable green tone at once indicates the presence of silver.

If we could only bring about this perfect substitution of gold for silver in the paper prints, we should then be on the way to perfection; but unfortunately at present we cannot. There cannot be a doubt that free silver plays an important part in the usual toning operations. Every one must have noticed with a new toning bath, that the first prints immersed in it are difficult to tone, and it is only after little time that toning begins in earnest. Why is this? I have no doubt that a certain amount of silver is necessary in the bath before it begins to work with freedom.

Now in the old days a bath was made up for each batch of prints, and thrown away after service; whereas now the almost universal practice is to employ the acetate bath and use it over and over again, strengthening up, when necessary, with fresh gold; and by this practice undoubtenly a much larger quantity of prints can be obtained with a given quantity of gold than by the old plan of a fresh bath every day; but I firmly believe this is at the expense of the permanency of the prints, aud that if we employed lime, borax, or carbonate of soda with the gold, and used the bath so made the moment it was in condition for work, and completely removed the free silver by salt, we should produce a more perfect deposit of gold; and though toning operations would be lengthened unless a very liberal supply of gold were allowed, we should in the end be rewarded with much more permanent prints.

ABOUT DEVELOPERS.

BY GEORGE SMITH.

The advent of gelatino-bromide, from the fact of its great rapidity, is admittedly a great step forwards. Alkaline development, however, would appear to be not only a distinct misnomer, but an error of direction, at any rate, in our present knowledge of the properties of sensitive surfaces. If there is one conclusion more than another to be drawn from past experience, it is that all the developers hitherto have been acid. In my experience I am led to conclude that the acid condition is essential to the development of gelatino-bromide. The most powerful developer I am acquainted with is ferrous-oxalate, when both solutions are distincly acid, both fully saturated, and mixed in the proportion of fully one of iron to three of oxalate. This will develop a fully-exposed plate to full density within a minute, while if the plate has received about a fourth of the normal fair exposure, it will still yield an almost ideally perfect negative, but take a very considerable time about it. As the margins in either case develop absolutely clear glass, it is a fair type of a normal developer, as I understand a developer. Potash and pyro is quite equal to it if slightly acid. Any acid, even pyrogallic acid in excess, seems to be a restrainer. I therefore believe and submit the problem for corroboration, that the amount of ammonia possible to use, without causing fog, is limited by the amount of acid of some kind in the developer. My own predilections are against gelatine, and in favour of collodion. No negatives that I have will compare for a moment with pyro developed, wet or dry collodion.

Sulphite of soda deserves special attention. It has a great affinity for oxygen, and appears to use it by absorbing the oxygen from the air, thus prolonging the life of the developer. The addition of it to a ferrous oxalate developer prolongs its developing power for an extraordinarily long period, plate after plate, with only very gradually decreasing power, judged by the time required to develop to full density.

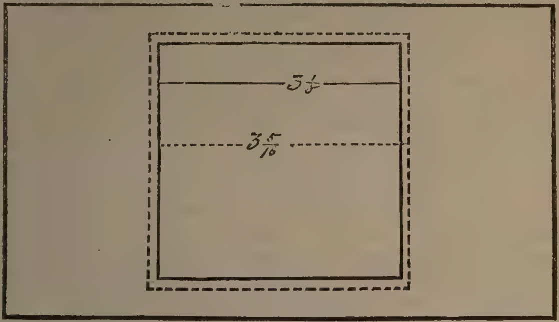
A NEW LANTERN SLIDE-CARRIER.

BY T. C. HEPWORTH.

When a man is in the habit of travelling about from place to place on lecturing intent, he will, if wise, reduce his impedimenta in the shape of lantern and lantern belongings to the smallest possible bulk consistent with efficient work. As much of my time has been and is spent in this way, I have given a great deal of thought to this matter of reduction of bulk, and have achieved some little success in it. But it is only to one particular point that I now wish to draw attention, and I do so in the hope that what I have done may be as useful to others as it has been to me. In the first place, I think that all lecturers will agree that each lantern picture should be fitted in a carrier of its own. The various forms of panoramic and shifting carriers, which are fixed in the lantern while the glass pictures are passed through them at the time of exhibition, are all very well for home use and private work, but in my opinion are not suitable for employment in public halls. I need not name all my objections to them, for one will suffice. The pictures are not sufficiently protected from breakage, and the risk of breakage even of one slide out of a set is a thing not to be thought of by a good exhibitor. At first I used 7 by 4 mahogany grooved carriers for all my pictures, but I found that they were objectionable on two grounds: one of these is, that they readily break; and the other is, that in packing they take up far too much room. It was to obviate these difficulties that I designed the carrier now to be described, and which I have had in constant use for three years with every success. My only objection to it is the necessity for making it myself, which is perhaps no real objection at all, for a little carpentry forms a healthy relaxation to one whose occupations are chiefly of a sedentary nature.

My slide carrier consists of a piece of wood 7 inches long and 4 inches wide, with a square opening in the centre to receive a glass picture of the standard size, $3\frac{1}{4}$ by $3\frac{1}{4}$ inches. This is faced on each side with a piece of cardboard, the opening of which is so much smaller as to form a rebate in which the picture rests, and from which it cannot fall out.

And now to describe the method of manufacture. First procure two pieces of sheet zinc each measuring 7 by 4 inches outside, but having openings of slightly different areas. These are indicated in the annexed cut, the opening in one piece of zinc being shown by unbroken lines, and in the other by dotted lines. It is best to make these patterns in the first instance in thin card, carefully measured and cut out with a penknife, and to hand them to a good workman to copy in zinc. (I may mention, in parenthesis, that here I found my chief difficulty. The average British working man who has been brought up in the zinc industry can make a first-rate chimney-pot, but when out of the chimney-pot groove is rather at sea. If he tells you that he can cut out in zinc your pattern correctly, "Trust him not, he's fooling thee ;" at any rate, carefully check his work, and you may find it out a trifle, and this trifle, when magnified in the lantern, is no trifle.) With correctly cut zinc patterns you can get through the work of making carriers very quickly. The pattern with the larger opening may be labelled W, for it is for *wood* only, and the other labelled C, for cardboard.



The wood to use is the best pine, which in thickness should approximate to the average lantern slide, say $\frac{1}{8}$th of an inch. This can be obtained at any good saw-mills. Laying the zinc pattern W, on this wood, and pencilling by its aid, a whole board can be quickly marked out for cutting. This cutting is best accomplished by using a sharp shoemaker's knife. The cardboard can be of the thinnest description, and this, too, can be cut in the same manner, using the zinc pattern designed for it. With several wooden pieces ready cut, and double their number of cards, you may now proceed to put them together. With good, hot, but thin glue, paint over one surface of the wood, and press one of the cards upon it, taking care that the centres of the two agree. Place the joined pieces on your work table, with a heavy flat weight above them ; when No. 2 is similarly treated, place it also under the weight, until you have a goodly pile of pieces of wood faced on one side with card. Leave them for a night. The next operation is to place a glass picture in each half-formed slide, and to glue the other cardboard face to each.

Once more the hot glue, and weight operation must be repeated until the batch—say two dozen slides—is complete. When complete, this batch, with a piece of blank board at each end of the pile, may be screwed up between a couple of carpenters' cramps, and left before the kitchen fire all day, or all night, until the glue is thoroughly hardened. When quite dry and hard, the slides may be separated, and again arranged between the cramps, in such a position that their edges can be run over with a sharp plane. After this they can be separately rubbed on every edge with glass paper, and when dusted, they are finished.

The advantages of these carriers are many. Firstly, you may drop one from a height of six feet from the floor with absolute impunity. Secondly, if the zinc patterns are correctly cut, the slides will register correctly with one another. Thirdly, six dozen, which is about the usual complement for a lecture set, will pack in the space occupied by three dozen under the old system. The sole disadvantage pertaining to these carriers is that the pictures cannot be readily shifted from one to the other. The remedy is obvious, for lectures of an ephemeral character—I mean for those the subject of which is merely of passing interest—use the old form of carrier. But for "things of beauty and joys for ever," adopt mine.

THE ROLLER SLIDE.

BY F. A. BRIDGE.

It is not my intention in this short article to enter upon the many arguments for and against paper negatives. Few professional photographers will ever use paper for ordinary work where a large number of prints is likely to be required. To amateurs (more especially when a few impressions are all that is necessary), paper offers many attractions, and to those working anything larger than half-plates the saving in weight is very considerable.

As to results. Well, I am bound to confess that I have often placed prints from glass and paper (un-oiled) side by side, and experienced professional photographers have been unable to tell "which was which."

There are two respects, however, in which considerable improvement might be made :—

Firstly.—A couple of lengths—and by this I mean the length of a couple of exposures—of yellow and black paper should be attached to each end of the spool, as suggested at one of the recent meetings of the South London Photographic Society. By this means a new roll could be inserted anywhere ; all that would be necessary would be to remember to wind off the protecting paper before exposing.

Speaking to a manufacturer about this, I was told that the join would leave a ridge or mark for two or three revolutions of the spool ; but surely this could be overcome by cutting each with a "feather" edge, or by bringing the edges together and making the join by means of a strip of thin paper at the back; or, if a join would be absolutely objectionable (which I very much doubt), surely a portion of the paper at each end might be stained with some non-actinic colour.

Secondly.—Another improvement would be some arrangement by which the use of a few films at a time did not necessitate the waste of several inches of paper, and also make it very difficult to calculate how many exposures still remained on the spool.

I am under the impression that a piece of thin material, permanently attached to the receiving roller, would meet the case. This, if coated with a sticky india-rubber solution, similar to that used by Mr. Warnerke, to attach the separate pieces of bromide paper in his dark slide, ought to hold sufficiently tight to allow the paper, when pressed in close contact, to be drawn over with ease, thus doing away with any waste.

It is universally admitted, by-the-bye, that paper negatives, both oiled and un-oiled, have a most undesirable habit of attracting to themselves many unconsidered trifles in the way of dust and dirt, that it is very difficult to remove. To those, therefore, who feel they cannot get the best results without rendering the film transparent, let me recommend the following:—Squeegee the film to a sheet of glass, coated with plain collodion, and when stripped, draw it through a mixture of pale gold size and turpentine; when it is dry you may defy dust and dirt, as anything of the kind is easily removed.

I was induced to try this plan, in consequence of Mr. W. M. Ashman having suggested this mixture as a good varnish fer gelatine negatives on glass. Of course the collodion may be dispensed with, if thought unnecessary.

A PRINT-WASHING MACHINE.

BY W. ENGLAND.

Prints on albumenized paper still maintain their popularity with the general public, and will do so, I think, for some time to come. Many other printing processes have been introduced, some with every promise of permanency, and no doubt, in some respects, more artistic; still, when most people are shown examples of silver and other kinds of prints, they invariably choose the former. This being so—and some years' experience has proved the facts—it behoves every photographer to do his utmost to render albumenized prints as permanent as possible. This, I know, has been urged over and over again, still too much importance cannot be given to this subject; very careful washing of the prints is absolutely necessary, and for this purpose constant movement and plenty of changes of water will best conduce to permanency.

During my experience of over a quarter of a century, I have used a washing apparatus which I have before described, but as the idea may be new to some of the present generation, I will again describe it, although it is somewhat difficult without diagrams.

A trough about 4 feet by 3 feet, and say 1 foot deep; this may be made of wood, pitched inside, but I prefer slate, which can be readily obtained at any slate works. Inside this trough fit a frame made of wood, about 8 inches deep, and a little smaller than the trough; this must be hung on centres, to obtain a rocking motion, and the bottom covered with gutta-percha strips half an inch wide, laid from end to end and across, so as to leave openings about an inch ; this will keep the prints from the bottom of the trough. A water-wheel, about 15 inches diameter, which may be made of Willesden paper or zinc, the latter any plumber can make ; this placed in a small cistern, sufficiently large to receive it, and fitted on the sides of the trough, will, by being connected to the inner frame with a crank, give the necessary motion. A small stream of water will work it, and will at the same time wash the prints by being conducted into the washing tank. One feature, however, I must not forget to mention, is that a syphon should be attached ; this will insure the water being constantly changed, and by being placed below the bottom of the inner tray will, on each occasion of emptying the tank, drain the prints, to enable them to again absorb the water. The whole of the arrangement is so self-acting that turning on the water supply is all that is necessary, and I am quite sure that the prints are thoroughly washed. I am told that a Glasgow firm has taken out a patent for a similar washing machine ; if so, I feel assured it cannot be valid, as many photographers have had one of these machines fitted up since I first described it.

SYSTEM, OR NO SYSTEM.

BY A. COWAN.

If "constant dropping will wear away a stone," perhaps constant agitation may eventually induce the photographic fraternity to adopt some recognized system of weights and measures when publishing new formulæ.

There have been from time to time, during the last few years, several attempts in this direction individually, but what is wanted is that those interested should strive collectively to come to some understanding as to which is the most desirable method. At present, nothing is more vexing than to find, after a considerable time spent in reducing a new formula to working proportions, that it is, perhaps, nearly identical with one already familiar to the user. It may be taken for granted that an experimenter trying any new formula wishes to intelligently comprehend the relative proportions of the various constituents, so that, should occasion require, he may be able easily to modify any of them according to his requirements ; this, under the present want of system, is extremely difficult. It does not seem probable just now that the gramme and centimeter system in use on the Continent will be readily adopted in this country ; but there surely is no valid reason why, if we cannot adopt that, we should not have one of our own—and, if possible, one easily interchangeable with the Continental.

Among the many methods from time to time advocated, is that of expressing all the quantities in grains instead of ounces (of two kinds), drachms, scruples, minims, &c., and the use of the percentage system in making up solutions. This system seems to have found much favour, and it certainly has the merit of simplicity and convenience, nothing being easier than to have a series of 10-ounce bottles, each containing one ounce of the various chemicals filled up with water; so that from any of these a given quantity required can be much more easily and accurately measured by taking ten times the number of grains required than can be done by separately weighing out each constituent. For this purpose there can be procured graduated grain measure of any capacity, from 100 to 10,000 grains, and any one once getting to use these will not easily be persuaded to abandon them. But it is possible, if a goodly number of those interested could be induced to strive together to settle the "battle of the gauges," some good recognized standard system might be arrived at, not only with regard to weights and measures, but in many other branches of our science.

POSITIVES ON GELATINO-BROMIDE PAPER.

BY H. TRUEMAN WOOD, M.A.

I HAVE frequently heard the remark made that it is impossible to keep ferrous-oxalate developer, and use it over and over again for the development of positives on gelatino-bromide paper; but as I believe this to be a mistake, perhaps a statement of my experience in the matter may serve for one of those practical notes which readers of the YEAR-BOOK expect to find in its pages. I have found that the iron developer, if, after use, it is strongly acidified with tartaric acid and kept in the light (in accordance with the well-known method), will serve perfectly well, weeks after it has been made, for the production of vigorous and brilliant pictures. The acid acts as a restrainer, and consequently a longer exposure is required than with freshly-made solution. It may also probably be assumed that a small amount of ferrous tartrate is formed, and this, according to Dr. Eder, is a far less energetic developer than the potassic ferrous-oxalate. Two prints on "Eastman" paper, one developed with fresh developer, and one with developer three weeks old, seem to me equally good. The latter was exposed half as long again as the former.

There is, of course, nothing really new in this suggestion, but it may be useful to those who are working with the new paper, and like to avoid the trouble of constantly dissolving up fresh quantities of the salts, and who are under the impression that developer once used is only available for the sink. I have a bottle of iron developer now that was first made and used in March, 1883. About a year ago it began to throw down a small crop of the ordinary green crystals of the double salt, but it still retains powers of development, a good deal impaired, I must admit, by old age.

A certain variety of colour may be produced in these prints by use of the ordinary intensifiers. Chloride of mercury and ammonia, followed by ammonia, gives a rich brown. Uranium and iron ferricyanide give warm tones up to deep red. It is, however, difficult to avoid staining the film. After-treatment with weak hydrochloric acid will remove the yellow stain, and even, by the deposition of Prussian blue in the paper, replace it by a blue one. Excellent moonlight effects may be sometimes produced in this fashion, but of course it merely amounts to tinting the whites of the picture.

PRINTING ON WOOD FOR ENGRAVERS.

BY A. BORLAND.

At various times in the News and in former Year-Books, so many processes for printing on wood for engravers have been given, that it may almost be thought unnecessary to go further into the matter, especially in these days of photo-mechanical processes for producing printing blocks.

If for no other purpose than that of recording the process, it may be well to give it; and, besides that, it may be of service to some one still engaged in this kind of work. I may say that in my hands it has been quite successful. In the first place, take one drachm of dried albumen, and dissolve in two drachms of water (tap water will do), and when dissolved filter through fine muslin, and then add enough of a 60-grain solution of nitrate of silver to coagulate nearly the whole of the albumen, after which place in a Wedgewood ware mortar, and grind until quite smooth. At this stage a little of any kind of chloride may be added, if desired, but I have not found it to be required in practice; or a little very fine zinc white may be added. This also is a matter of taste, and is not really required

To coat the block, first whiten as for drawing upon, and when dry, spread a very little of the albuminate of silver over the surface of the block with a stiff brush, and then smooth with a badger hair brush or softener; dry by gentle heat. Print about as deep as on albumen paper, and tone and fix as usual. In working the above it is best to soak the albumen over-night, and stir well before filtering through the muslin, and, before coating the blocks, to damp them slightly on the back, especially if large, as this tends to prevent the block from being curved on the face. In toning and fixing it is well to support the block so that the surface only is in contact with the solutions, and to wash, after fixing, in the same way, very little washing being required. Blocks printed upon in this way have the following advantages: viz., they do not turn black if exposed to strong light after fixing, and after they are dry they may be drawn upon with pencil or brush if corrections or alterations are required, and if the print is imperfect from any cause, it can be removed at once with a damp sponge, and the block used again.

THE AREA SYSTEM OF MARKING LENSES AND DIAPHRAGMS FOR PHOTOGRAPHIC PURPOSES TO ENSURE CORRECT EXPOSURE.

BY GEORGE SMITH.

Every one knows that there is a distinct relation between the aperture and focus of the lens, which must be accurately known in order to ensure exact exposure.

If he only uses one lens and one aperture, he will soon find that even with the same light the necessary exposure for various subjects will vary enormously.

If he was compelled to work with such a lens, the best aperture he could choose would be what is known as $\frac{f}{16}$—that is, that the diameter of the aperture or hole in the lens-mount should be one-sixteenth of the distance from the lens to the focusing screen. This ratio of aperture to focus—1 to 16—is that which by general consent has been allowed as the one which, on the whole, presents the fewest disadvantages.

It would be an excellent system to begin with, if even he found—as he would undoubtedly find—that he wanted more than one or two lenses. If they were all fitted with the same relative apertures $\frac{f}{16}$, he would soon find that when he had mastered the correct exposure it would generally lead to improvement in the results, if he had the means of altering the size of the aperture, and, therefore, the duration of exposure. This is all that the "area system" professes to do. The learner must learn the conditions which govern exposure generally, and then the area system will greatly facilitate the application of that knowledge to the real work which requires the continual change of both lens and aperture. He must, then, first of all make a table for himself of the normal exposures necessary for different classes of subjects, variations of light, and speed of plates, from which the still necessary correction for the relation of lens and stop will be shown at a glance by the area numbers. The principles upon which the area numbers are calculated are extremely simple. They are applicable to any existing lenses in daily use without any infringement of patent rights, and will be found exceedingly useful in everyday work, while also affording a very simple and accurate method of comparing results with other experimenters. Any aperture or stop is measured for its actual diameter in sixty-fourths of an inch. The simplest way of doing this is to take any of the mechanical drills to be got at any tool shop. The number of the drill is its diameter in sixty-fourths of an inch. This number is squared —multiplied by itself—the product is the exact area of the aperture in circles each one sixty-fourth of an inch in diameter. For instance, supposing a hole were made with a No. 20 drill, or, being made, the No. 20 drill fitted it, 20 by 20 equal 400 would be the actual area of the aperture in circles of each one sixty-fourth of an inch in diameter. For convenience the last figure is omitted, and the stop marked 40. This, then, will always be No. 40 stop, no matter for what lens it may be used. All the other stop numbers are found in the same way, by finding the diameter in sixty-fourths of an inch, squaring and striking off the last figure; the remaining figures are its area number.

Any lens is measured for its actual focus by measuring the distance of its burning point from the back of the lens in complete quarter inches, neglecting fractions. Suppose, then, a lens was found to measure 20 quarter inches: 20 by 20 equal 400; striking off the last figure, 40 would be its area number. Any other lens would be measured the same way in quarter inches. This number multiplied by itself, and the last figure struck off, the remaining figures are its area number. Thus it will be seen that every stop has its own number, and that whatever relation that number has to that of the lens it is used with, gives at a glance the relative exposure required. If it is the same as the lens number, the exposure is exactly the normal table exposure estimated for $\frac{f}{16}$; divided into the lens number the product is the exact multiple or fraction of that exposure necessary.

Thus a doublet lens should have each lens marked with its area number separately. The area number for the combination will be the two separate numbers added together and divided by 8. Thus by numbering the stops of, say, a rapid rectilinear lens separately after careful measurement, and then calculating the area numbers of each lens as well as that for the combination, not only would the exact exposure for either of the lenses separately be ascertained, but very likely great discrepancy in the real relations of the stops.

In practice no table at all is necessary after moderate experience. No table can estimate the value of varying light, and no photometer is more than an approximate guide. Every factor—light, time of day, season—should be separately estimated and noted as a reason for variation from the following simple formula—Mr. Howard Farmer's table of distances of the nearest important deep shadows:—10 feet 4, 20 feet 2, 40 feet 1, 100 feet $\frac{1}{2}$, 100 yards $\frac{1}{4}$, quarter mile $\frac{1}{8}$, over quarter mile 1-10th seconds. This can be easily remembered (or jotted down) as the only table, and is an excellent standard for ordinary rapid plates called 30 times, aperture $\frac{f}{16}$, bright summer diffused light, best time of day and year, here or anywhere. Sunshine reduces exposure one-half if the shadows are lighted up by it either directly or by reflection.

ARGENTOUS SALTS.

BY COSMO I. BURTON.

I HAVE certain reasons for not believing in the existence of any series of silver salts lower than those at present known.

There is a very great resemblance between the silver salts at present known, and the cuprous salts, as will appear at once on comparing the following descriptions:—Silver chloride, $AgCl$, white precipitate insoluble in water, sensitive to light, soluble in hydrochloric acid (sparingly), very soluble in ammonia; cuprous chloride, $CuCl$, white precipitate insoluble in water, sensitive to light, soluble in hydrochloric acid (freely), very soluble in ammonia. It is true that there is one very wide difference: cuprous chloride readily absorbs oxygen, being converted into cupric chloride and oxychloride, while silver chloride is unaffected by oxygen; but this notwithstanding, I consider that the analogy between the cuprous salts and the silver salts is sufficient to indicate that these latter ought to be called argentous rather than argentic, as at present, and that if any new series of silver salts is discovered, it will be a higher series than that with which we are acquainted, and the formulæ of the new silver chloride bromide, &c., will be $Ag\,Cl_2$ $Ag\,Br_2$, &c.

ON THINGS IN GENERAL.

BY ASSAM.

Ordinary dry plates ought to keep for an indefinite time in a dry climate, however hot or cold it may be, but they soon go bad if the climate be damp as well as hot, unless packed better than most dry plates are. The plates I have seen have been packed in one of three ways inside the boxes.

1. Close to one another, having only a piece of paper in contact with the sensitive surface between this and the next plate. The objection to this is that if the gelatine gets damp, the paper or dust from it sticks to the surface and damages it.

2. The plates are in grooved boxes, and this is most objectionable where they receive rough usage in transit, as dust is caused by their fraying the surface of the paper grooves, and this settles on the plates; and if by any accident one plate gets broken, then it is almost certain all the others in the box will be broken or damaged.

3. The plates are separated from one another at the edges by thin strips of cardboard, and this, I think, is the best method I have seen.

The boxes are generally flimsy cardboard, not sufficiently strong to properly protect the plates, and they are far from damp-proof. I would suggest that, for tropical climates, at least, tin boxes, holding two-dozen, should be used. (Negative paper is now packed in boxes containing two dozen, and there is no reason why all but very large glass plates should not be two dozen in a packet.) If the cap overlaps the box two or three inches it will be practically light-tight, and by gluing paper round the join it will resist almost any amount of damp. If the box be half an inch broader than the plate, it can be used for storing negatives by putting in wooden grooving. Anyhow, it would be useful for many purposes, and most persons abroad would not object to paying 3d or 6d. extra for the better box.

I should like to see the formulæ for developing pasted on outside the box as well as enclosed, so that one could make up developers before starting on a journey or opening the boxes; also that each maker should state distinctly the number of grains of each chemical to each ounce of water used in developing a properly-exposed plate.

This is a minor matter compared to knowing the relative rapidity of different plates, as it very often happens abroad that we cannot get the plate we want. and have to use a strange plate. At present most makers state that their plates are so many times as rapid as a wet plate; but if two plates by different makers, supposed to be, say, 30 times, are tried, it will probably be found that they vary considerably in rapidity; and so, when using a strange plate, we run a considerable risk of failure. Cannot the makers test each batch of plates by Warnerke's standard sensitometer, and mark each packet with its sensitometer number, and its rapidity compared with a plate which registers No. 1? We could then know approximately the exposure we had to give a strange plate.

I have come across several lenses by first-class makers whose focus did not agree with the equivalent focus given in the maker's catalogue. I have just tested a lens by one of the best makers, the equivalent focus of which is given in his list at 8½ inches, whereas it is actually 9¾. Another was actually about 7 inches, instead of nominally 8½. It would be very little trouble for the maker to engrave on the mount the equivalent focus of the lens, whereas at present, unless one actually tests it, there is no knowing what the actual focus is; and from the want of this a lot of unnecessary trouble may be caused. Also I would like to see the U.S. number engraved on each stop (the maker may put any number on the other side he likes). With this information, and the certainty of its correctness, it would be far easier to compare any two lenses than at present, and to judge what exposure to give to any plate with any stop.

I think most of these suggestions have been made before, but they do not seem to have been acted on, and though they may seem trifling to one in England, they are by no means so when abroad, and no one near to consult with.

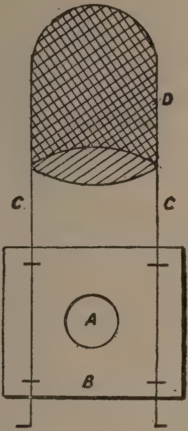
LIGHT IN THE DARK ROOM; AND A SHUTTER.

BY J. W. ZAEHNSDORF.

The question of light in dark-room has certainly not been worked out, for Mr. Hastings showed at the Photographic Club some plates he had backed, and were fogged while standing out to dry, and he quite proved that it was light fog, because those portions of the plates which were protected by the backing were free, the others not protected were marked. His dark-room window was protected by three or four thicknesses of golden fabric, and one is inclined to blame the fabric as not being safe. On further inquiry I found his room was brilliantly lighted by the sun during some parts of the day, and that the window had been blocked after the sun had passed. Now, it has struck me that, light was exerting its influence after it had gone—bottled light, if I may use the term—and I intend, when we get sunshine again, to try the effect of placing a card in the sun for some time, and then in contact with a dry plate in my drying box, I should not be surprised if I get an impression of the card. The experiment will be interesting, and will, perhaps, give us some further knowledge respecting the question of unanswerable fog. I am quite satisfied with the golden fabric, and feel certain it is quite safe, but it is advisable to change, or rather replace, with a new piece once a year.

I am of the opinion that it is not the most expensive apparatus that gives the best results, and I also hold that the shutters now made work far too quickly for such work as falls to the lot of an ordinary mortal.

Here is a shutter that can be made with such things as may be found in any house.



A—Cap for lens.

B—Base-board made either of wood or millboard.

C—A piece of strong wire, bent into shape, sliding stiffly through staples or eyes driven through B.

D—Velvet hood (doubled) perfectly light-tight.

To use the shutter. When focussed, place cap on lens; to expose, take cap gently off, and pass the shutter quickly down in front of lens, recapping the lens with the hood. Both hands are now free to close the dark slide.

The quicker the movement in uncapping and recapping, the shorter the exposure ; and if a very quick exposure be required, the wire may be slid down, leaving only a very small space between cap and hood.

I have used this shutter with very good results, and often prefer it to one I have bought.

Mr. Wellington's suggestion of flooding plates with warm gelatine, and then washing off and drying before coating, has placed me in a far better state of mind since I have used the method. My collodion films do not now go down the sink.

GELATINE NEGATIVES AND THEIR PRINTING QUALITIES.

BY H. J. E. HAAKMAN.

WHEN overhauling, the other day, some two hundred gelatine negatives to remove them from a very damp place, where they had remained from six years to one year, I observed that, notwithstanding the dampness, all of them, whether developed by iron or by pyrogallic acid, had remained good, provided they had not been intensified. But those that had been intensified had suffered more or less. They had turned yellow either over the whole plate, or in spots.

What struck me most, however, was the difference in beauty between the negatives and the prints obtained therefrom on albumenised paper. With a fine collodion negative—either by the wet or by the dry process—we may be sure of getting a fine print. I think it is not so with gelatine negatives. I am almost inclined to say their beauty is deceptive. An indifferent-looking negative will sometimes give a very good print, whilst a splendid one, showing all the tints between black and bare glass, will give, it is true, a very fine print, but not so fine as one would expect from the appearance of the negative. And I have remarked that this is not only the case with my own plates—all made by myself with self-made emulsion—but also with those by Burnsert de Nys, and other first-rate makers. This summer I saw some splendid clichés, with instantaneous exposures, full of details of gradations of tint, &c., all made on the plates of, perhaps, the best Continental dry-plate makers. But when it came to the prints the matter changed, and it was evident that the cliché had not been strong enough. They had been over-printed as far as the shadows and middle lights were concerned. Or, in other words, in order to get the necessary depth of colour in the print, so that it might withstand the toning and fixing-baths, it had been necessary not to be too particular about the after-appearance of the shadows and middle-tints. I know very well that more or less can be done by dodging with tissue paper, but I think that this should be an exception, and that, as a rule, a good negative should not require it.

I have a notion that the same as we changed our negative process, we ought also to change our mode of printing. Some twenty or thirty years ago the pages of your periodical would have opened, perhaps since, an amicable discussion on this subject. But nowadays things have changed; perhaps not for the better. The technical part of picture-making seems to have lost its interest to amateurs. Since plate-making has become a business, it is very seldom that a new advance is ventilated, unless in an editorial, or in the reports of the London and Provincial Photographic Association. Actually there seems to be a high road to success.

The many bromide and chloride of silver gelatine papers in the market claim that they have overcome the defect at which I hinted, and that the details come out much better in the printing, than with the albumenised paper. Everybody has more or less experimented with them, and seen, perhaps, the splendid prints published by the Eastman Company, which they send to the dealers as samples. (I presume they were over-printed from collodion negatives.) So I can pass them by in silence. To these processes I have, however, the objection that, being development processes, the exposure has to be watched to a nicety. This is all very well when a great many prints are to be taken in rapid succession from one negative, because one or two trials will determine the exact amount of exposure required ; but with an amateur the case is different. And then the saving in time is only apparent ; you can but attend to one cliché at a time, whilst with sun printing one man can overlook two or three dozen printing frames. The development, toning, and fixing, with their many intervening washings, require certainly as much time and more care than with the old process.

I always like to be able to see what I do, and therefore prefer sun printing. A few weeks ago Mr. Woodbury drew attention to the high qualities of a sensitised paper, which Dr. Liesegang, of Dusseldorf, brings into the market under the name of Aristo paper. I wrote to Dr. Liesegang, who immediately obliged me with a few samples. To all appearances, and judging from Mr. Woodbury's later communications in the News, this is our old friend, the collodio-chloride of silver paper, under a new name. I must frankly state that during my thirty years' experience as an amateur I never met with anything better. With this paper printing is a pleasure. The operation proceeds not only much quicker than with albumen paper, but the prints have from the very first a pluck which they retain during all the stages they have to pass through. And, as Mr. Liesegang claims for his paper, weak negatives will do as well as strong ones, which, in my eyes, is a point worthy of the highest consideration. The highest results can be obtained with no more than ordinary trouble. I hope nobody will consider these lines as the puffing of a commercial artice. I can certify that I do not even know the maker. Moreover, from the graphic description given by Mr. Woodbury, one can make the required collodion emulsion for himself, with or without having first given a fair trial to Dr. Liesegang's paper.

SELF-HELP.

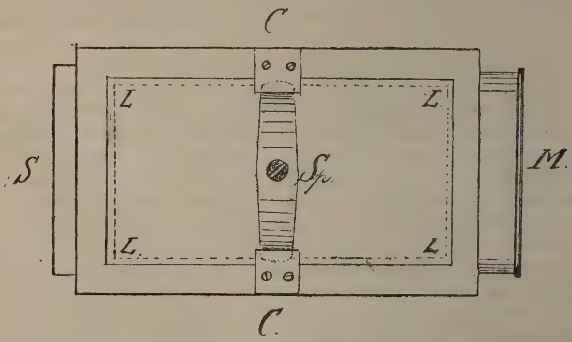
BY PETER KNUDSEN.

Perhaps the following may be interesting and helpful to those amateurs who, as I, find a pleasure in making their own apparatus.

My camera—a 5 by 4—I have made of the modern form, with moveable front and reversible back. Instead of making three or more double dark slides—a difficult work for an amateur, considering the necessary accuracy—I have made but one single, and constructed this after the fashion of a printing frame, as a matter of course provided with the usual sliding shutter. At the extreme end the slide is provided with what I may call a mouthpiece, through which the plates are inserted. The back of the slide is fastened thereto with a light-tight flexible cover of rubber cloth, this allowing the back to be pressed against the plate or loosened, *ad libitum.* The pressure is effected by a spring and spring-catches, just as in a printing frame.

For the plates I have made—say twelve—bags of thin cardboard, covered with black cloth, and marked on the one side with a white number. Round the open end of the stiff bag or envelope, which is but a little wider than the plate, is fastened a double light-tight piece of cloth—rubber, perhaps, answers better—about six c.m. long and a little wider than the mouth-piece on the dark slide, on which it should go easily.

In the evening, by a safe yellow light, I fill my twelve or more bags with plates, inserting these with the film side at the same side on which the bags are numbered, to prevent exposing the glass side when in the dark slide. The flexible part of the bags is bent over to prevent light entering the plate.



S, Shutter; M, Mouthpiece; Sp. and C, Spring and Springcatches; L, L, L, L, the Lightight Cover of the Back.

To get a plate in the slide, I first loosen the spring on the back to allow this to go back; then, after drawing the mouth of the bag over the mouth of the slide, and fastening it there by a spring clip, the plate is slipped from the bag into the dark slide, leaving the empty bag on the mouth-piece of the slide to prevent light entering the same. The back of the slide is now pressed against the plate by the spring and catches, and all is ready for exposure.

Exposure given, again loosening the spring to allow the plate to be slipped back in the bag, the flexible part of which is again bent over, thus closing the bag against light.

In this manner I have changed the most sensitive plates with complete safety in bright sunshine. Stowed in this way twenty to twenty-four plates in bags occupy not more space than three or four usual double dark slides.

Altogether I think the above-named results by such simple, home-made apparatus are very satisfying.

My tripod, too, is very handy. Each leg consists of four round pieces of wood—ash or birch answers very well—36 centimetres long and 1½ centimetres diameter, joined with three pieces of brass tube, same diameter, and 8 centimetres long. The brass tubes are in their half length secured to the one end of the the three wood pieces, the fourth of which is fastened by a screw in the usual manner to the top; putting up the tripod is managed, it will be seen, as in the case of fishing rods. To make the tripod stiff, a triangular piece of heavy linen-cloth, each side 35 centimetres, is hooked as a shelf between the legs and a weight, the camera case or a stone is put thereon, causing the legs to bend a little inwards. The shelf itself is in many cases a very convenient thing. The tripod packed in its holster has the dimensions 42 by 8 centimetres, and the whole is unpacked and put up in half a minute.

One thing more I will mention. Do not begin to work on such things before you have made a complete and detailed plan and design of the whole; if you do, you may have to alter a thing more than once.

THE DEVELOPMENT OF PAPER NEGATIVES.

BY ARNOLD SPILLER.

During the past season, having met with several amateurs who have declined to adopt the paper negative process, through the difficulty of producing a brilliant image, free from granularity, I venture to think that a few words on the practical development of these films may possess some interest to many readers of the Year-Book.

While still recommending the same pyro and ammonia solution as used for plates—notwithstanding the many advocates of potash and soda—I always adopt an important modification in the mode of developing, first suggested to me by Mr. R. L. Kidd.

Before describing the process, it would perhaps be advisable to consider the cause of a granularity in some paper negatives. It is well known that on dipping well-milled paper in emulsion, the water causes the material to swell unevenly, according to its texture, and thus, when the sensitive mixture dries, the gelatine film, if separated from the paper-support, would, on its under side, present an appearance almost as uneven as a piece of woven fabric. Now comes the question. Granted the film is of such an irregular character; how is it ever possible to produce a paper negative free from granularity? The answer is very simple. It is well known that all gelatine films contain a large excess of the sensitive salt; if, therefore, the development be so carried out that the image is produced only on the surface or the upper layer of the film, it is obvious that the under layer, which is so wanting in uniformity, would be without effect on the deposit. The production of this non-granular, or what one might call superficial image, can always be ensured by bringing up the density, during development, as quickly as possible.

The procedure is as follows:—For exposure,* about half as much again as would otherwise be considered normal should be allowed; the film, after being moistened in plain water, and gently gone over with a camel's hair brush, is treated with the pyro-ammonia, using to commence with only half the full proportion of ammonia.

If all goes well, the main details should be up in a minute-and-a-half; the remaining proportion of ammonia should be added from time to time, and the solution poured backwards and forwards from the dish to the developing cup, just as one would proceed in the wet plate process, till sufficient density is obtained. By so keeping the solution in constant motion, the bromine—set free from the silver haloid during its reduction—is at once washed away from the immediate neighbourhood of the image-forming salt, and thus preventing it from exercising a powerful restraining action where it is *not* required.

In conclusion, I may remark, by adopting this mode of working, I have not met with a single granular negative.

SHORT ARROWS.

BY GREENWOOD PIM, M.A., F.L.S.

Not a few articles in the Year-Book are painfully expressive of the perplexity the author feels when called upon by the Editor for a contribution. At first I used to laugh at such; now I can sympathize, as I find myself in just such a plight. I could not think of refusing the Editor's request, and am at the same time sorely at a loss for a subject, so trust he will pardon one or two discursive notes which, though perhaps familiar to many, may possibly be new to some, or even one.

Development with a Brush.—I recently had occasion to photograph a number of leases and other documents on 12 by 10 plates. The owner, not unnaturally, did not wish them to be removed from his premises, and the only available place was a very small conservatory, in the heart of a town where the light was fairly strong, but somewhat unmanageable. Hence, on developing, parts came out quickly, and parts hung back. To remedy this, I found it a decided advantage to have a small quantity of the potash solution, made *à la* Beach, but diluted with 30 per cent. of water in a cup, and when the plate was partly developed, to paint over the backward parts with the potash, using a flat camel hair brush. On again flooding with the developer, density proceeded much more evenly than without the brush treatment. Of course it must be done carefully and boldly to avoid markings, but there is no real difficulty. With ammonia I think there would be a tremendous risk of fogging, but the action of the potash is so slow as to minimize the danger in that direction. I also found that similar treatment was applicable to Eastman positive paper, by having a strong iron developer in a cup, and brushing it over the sluggish parts of the print.

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* This, of course, also allows of considerable latitude of exposure.

Carrying Exposed Plates when Travelling.—We hear so much of elaborate and costly methods of carrying plates, that at the risk of repetition I venture to draw attention to a plan I have used for several years with the greatest success. Get some tin or zinc boxes, made like ordinary plate boxes—for small sizes the last-named will do fairly well, although there is a tendency to split—and for each provide a piece of red Turkey twill, well washed and thoroughly dried. Fold up the exposed plates in the twill and place in the box, a rubber band keeping all tight. No need to put anything between the plates, and two or three plates will travel as well as a dozen, which should fill the box. The only time I ever had a plate scratched was a developed one, which, whilst drying in my room at Grindelwald, picked up some particles of dust which adhered to the film; fog I have never had from bad packing. It is desirable to have a new piece of twill every journey, as the corners of the plates sometimes make holes; but it is not a very expensive commodity. The tin or zinc boxes will make available trays to develop an odd plate in now and then, to try exposures, but must, of course, be well washed and dried before using to pack plates in. For development it is desirable to have the interior covered with varnish or paraffin, but it is not absolutely imperative, as the solutions used do not affect zinc or tin very much.

LESSONS FROM THE PHOTOGRAPHIC EXHIBITION.

BY EDWIN COCKING.

ONE of the most noticeable matters at the recent Photographic Exhibition was the drifting away from the old moorings of photographic sizes, which for so long a time has held the photographic world in a state of bondage. However, now that the chains have been broken, we shall expect to see a good and proper use made of this freedom.

There can be no doubt that the having to fill up certain portions of some of the old sizes has caused a vast amount of rubbish to have been shot there, which did no good to the subject matter, and which must have tried the patience of many an enthusiastic poser. But now that he can feel at liberty to bring up the outside lines of this picture so as to emphasise the subject, whether it be figures or landscape, so in time will he become more at home with the new power, and we shall see it gradually coming into general use.

This has been one of the trammels to which the art side of photography has been subjected, in consequence of the commercial or trade element in connection therewith having got into a kind of cast iron system, subjecting all those art instincts (which prompted certain advanced exponents to attempt a departure) to a positively cold treatment, because there was no "entourage" in the trade which could assist it; but when once the few who had the will and professed the power to command their own way made the commercial subservient to the mental, then we recognised the amount of good which had been achieved. This improvement has been gradually gaining ground during the past few years, and it will be admitted by those who have any acquaintance with the photographic productions of twenty years ago, how absolute was the law which caused the photograph to be the exact outcome of the particular sized glass upon which the negative was taken, and the public, forsooth, also looked upon their bargain, and, Shylock-like, demanded their full pound of space, so that whether the subject was large or small, tall or short, the outer wall which enclosed them must always be the same identical size as their neighbour's. The carte-de-visite had a great deal to do in continuing this state of things, although its commercial aspect in being sent out in given numbers had much to say for its existence.

Then, again, in landscape work, there everlastingly occurred the necessity imposed upon all, of using up every portion of the matter photographed upon various sizes. This has utterly ruined many a scene, which if it had been cut to its own artistic requirements, would in many instances have assumed different proportions.

But the gradual growth of cultivated art-instincts has at last burst these bonds, and there was one very marked example of this in the late exhibition, where several sized photographs were enclosed in one frame, no two being alike in length or width, the result being a most attractive and interesting series.

One very curious matter arising out of this departure was this—that in other frames, where several photographs, all of one size, were fixed, the effect, upon looking at them casually, was tame to a large degree, and this exemplifies very strongly that which I have always insisted upon—viz., that every photograph which possesses in its own right something exceedingly good, should always be located in its own frame, and not be united (in a Siamese fashion) with another spirit more wicked or unlike itself. These matters are gradually opening themselves up to the notice of exhibitors, who, if they could only be shown how at an exhibition one picture or frame sometimes makes or kills another, would pay more attention to their own before it left their studios. There is a large field open now for giving full swing to this departure, and more especially in landscape can this be utilised. There are many subjects which, starting from a twelve by ten plate, may, by judicious and careful cutting down, first on the sky and then on the foreground, be composed into a more effective bit, and here will come in the latent art instinct; and if this be wisely carried out, we shall hope at our next annual display of photographs to see and appreciate many subjects which, in their normal size, were uninteresting and unemotional, but which by study and thoughtful alteration have eventually been converted into pictorial gems.

SMALL CAMERAS.

BY GEORGE F. WILLIAMS.

THE time was when I entertained little short of contempt for any man who worked landscapes with anything less than an 8½ by 6½ camera. I refer to the days of dried bath plates; when stereoscopic was the only small size tolerated, and when a man's status in photographic society was settled very much according to the size of the plates his camera would take. To work a half-plate camera was almost synonymous with the appellation of novice; but to be seen with a 5 by 4 or a quarter-plate camera was quite enough to stamp a person as an out-and-out duffer.

At the period to which I allude, large pictures were in fashion, and anyone with any pretensions would hesitate at being the exhibitor of a size under 8½ by 6½, whilst very many aspired to much larger sizes, 9 by 7, 10 by 8, 12 by 10, and, if my memory serves me, one amateur went to 30 by 24 inches. Of course, all this was prior to the popularity of lantern slides produced by photography. Notwithstanding the development of this branch of the art, it is quite probable that matters would have remained much as they were, so far as the fashion of large sizes applies, for whilst bath plates or even collodio-bromide plates were the only ones obtainable commercially, or within the power of the amateur to produce, photography was naturally confined to a class of men who did not shrink from work requiring considerable skill and patience in the preparation of their plates, the *impedimenta* of large and bulky apparatus, and tedious exposures, with messy development to follow. These were amateurs in the truest sense of the term.

The introduction of gelatine plates revolutionised the fashion of size of plate, much as it changed the whole procedure; and when it became known how easy was the exposure and subsequent treatment of gelatine plates, there came a rush of fresh recruits, men—aye, and women too—of every grade, who had had no previous experience of photography.

There are few wants in life nowadays but what can be supplied for money; and as a result of the foregoing, innumerable patterns of small cameras made their appearance in the shops of dealers in photographic apparatus; some of these are of poor quality, but the bulk are neat, well-made, portable, compact, and serve the purpose.

I wish to bear testimony to the pleasure that may be derived from the possession and use of a small apparatus. I purpose describing one I have. It consists first of a neat hand-bag, similar to what is known as a brief bag. This will hold a "pocket" quarter-plate camera, with three double slides; a 4-inch and a 6-inch Ross portable symmetrical lens, which I find enables me to cope with almost any subject; a drop shutter with pneumatic trigger; the focussing cloth and tripod head; and I can find room for a one-dozen packet of plates in the bargain. With such an apparatus and a neat and light folding tripod, one may make it the companion on one's journey; it is inconsiderably light, and calls for no special care, which a large-sized apparatus demands. There are many chances of securing pretty bits of scenery if a set such as this is handy; it takes but a minute to erect the tripod and focus a view, and a like period to replace the apparatus in bag after an exposure is secured. Fixed to the back of a tricycle, its value is even greater than when carried by hand, for its weight is then apparently *nil*. If one returns from a trip with no plates exposed, there is not the feeling of regret experienced of considerable labour and inconvenience of lugging a heavy apparatus about.

I keep my camera bag always ready to be taken away at a moment's notice. If no plates are in the slides, and one is in a hurry, there are dealers who, if the slides are sent to them with a polite message, will open a box of plates, fill the slides in their dark room, and send them back in half an hour ready for use.

To the possessor of such an apparatus I would address one word of advice. There is now the keenest appreciation of lantern slides, and it is by no means improbable that slides made by photographic processes will ultimately take the place of all others. No matter what size plate the camera takes, I would advise the focussing glass to be distinctly marked with strong lead-pencil lines, with the area in middle of 3 by 3 inches. Within this space the amateur should have a care to see that there fall the principal points of his view. If this idea is kept prominent in the mind, his resulting negatives will have a two-fold value. Printing therefrom by contact on plates 3¼ by 3¼ will yield him unique lantern slides; whilst by judicious care in focussing, to see that the whole of his negative is sharp, he has the means of procuring enlargements, the perfection of which will greatly depend upon the care bestowed upon the negative.

MODES OF DETERMINING THE SPEED OF RAPID SHUTTERS.

BY WALTER A. WATTS, M.A.

It occurs to most amateur photographers at some time or other to desire to determine the speed of some form of shutter, either for purposes of comparison, or to obtain an approximate idea of the length o exposure they are giving in some particular case. Several methods have been proposed for this purpose, some of which require special mechanism fitting, whilst others involve a more or less elaborate calculation, quite enough in either case to interfere with their general application. I have no new plan to propose, but simply wish to show how, by existing methods, the required result may be most easily obtained. Most plans proposed may be classified under one of two heads—first, those which actually measure the speed of the moving part; and second, those which determine by exposure of a plate how long the lens has remained open.

Of the former class, the simplest is, in the case of a drop shutter, to measure how far the shutter has fallen before the lens begins to open; and again, how far it has fallen when it is just closed. The time a falling body takes to fall a certain number of inches is easily found by mathematical calculation, by the formula—

$$s=\frac{f}{2}\cdot t^2$$

or for those not versed in mathematics may be taken from a table like the following, which I extract from a paper by Mr. George Smith.

A body	falls the	1st	inch in	·07215	seconds.
,,	,,	2nd	,,	·02987	,,
,,	,,	3rd	,,	·02294	,,
,,	,,	4th	,,	·01934	,,
,,	,,	5th	,,	·01702	,,
,,	,,	6th	,,	·01537	,,
,,	,,	7th	,,	·01421	,,
,,	,,	8th	,,	·01313	,,
,,	,,	9th	,,	·01241	,,
,,	,,	10th	,,	·01169	,,

This method is, however, only applicable to a shutter dropping quite freely, and is quite useless where it is hastened by springs or rubber bands, or any such contrivance.

It is also open to the objection, which applies equally to the other methods of measuring the actual speed of the moving part, that it is difficult to determine when the lens is efficiently open, the first tiny opening not being enough to make any efficient impression on the plate; and similarly there is a fraction of the time just before closing, when the amount of light admitted is equally inefficient. Besides, a drawback to the use of the table is that it is rarely, perhaps, that the shutter will begin to open or close at an even number of inches. Suppose it opens at $2\frac{7}{8}$ inches, and closes at $5\frac{1}{4}$ inches, those numbers are not provided for in the table, and the times are not in direct proportion between any two successive numbers, so that it would not do to take $\frac{7}{8}$ and $\frac{1}{4}$ of the differences.

These may be taken off, however, from the diagram accompanying this paper with sufficient accuracy, as the curve represents the course of a freely falling body.

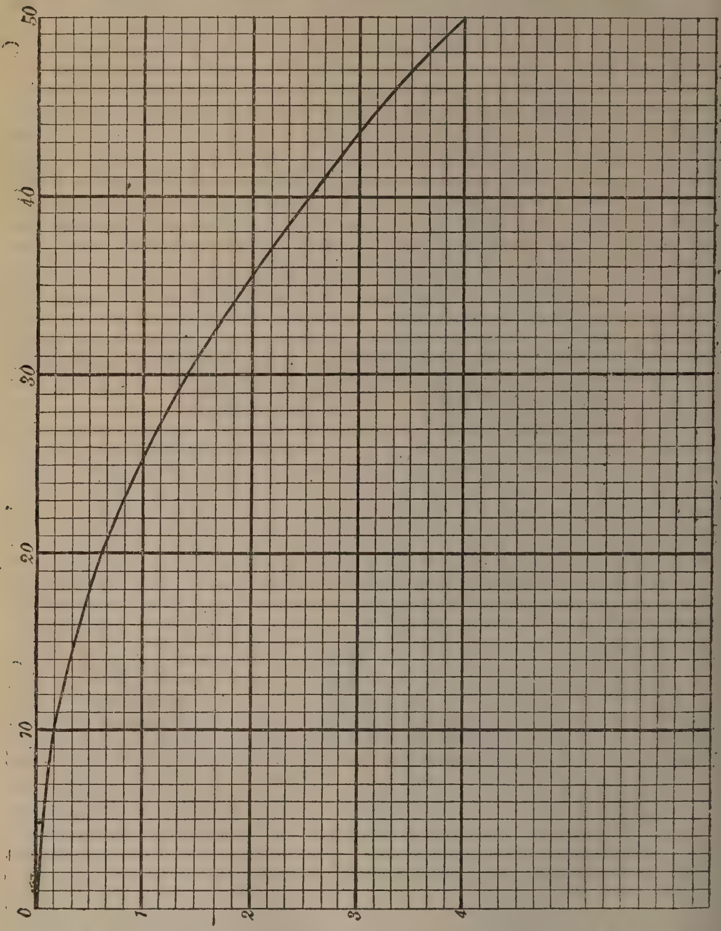
Another method of direct measurement, which, I believe, is Captain

Abney's, gives greater accuracy, and is applicable equally to revolving shutters or those actuated by a spring. It consists of covering the moving part, or a card attached to it, with lampblack, and allowing a point attached to a vibrating tuning-fork to trace a curve on the blackened surface whilst the shutter is moving. The note of the fork being known, its number of vibrations is known; and hence, from the number of waves in an inch, or other convenient length, the time it takes the shutter to traverse that distance may easily be calculated. This, however, requires somewhat delicate manipulation, and perhaps more knowledge of mathematical calculations than the majority of amateurs can be assumed to possess, besides being also open to the objection named above, of not allowing for the inefficient fraction of the opening.

Of the second class of methods—those, viz., which take advantage of the efficient portion of the opening for photographically impressing a plate—there are several of more or less facility of application. One of the best is probably the one described, I think, by Mr. Driffield, who takes a clock, and, removing the pendulum and regulating gear, causes a hand to traverse the circumference of the face once in a second; the circumference being divided into one hundred parts, the object is focussed, and the shutter actuated whilst the hand is revolving. The result, on developing, is a blur extending over a certain number of degrees which gives with great accuracy the number of hundredths of a second the plate has been exposed. For greater distinctness of reading, the clock face is blackened, and the hand made of white polished metal. This method, on the other hand, requires considerable mechanical skill, and we have not, all of us, a clock which we could readily devote to the purpose; and besides, although I have not myself tried it, I imagine there would be some difficulty in so regulating the motion of the hand as to make it travel round precisely once a second. The method, however, is undoubtedly ingenious, and in practised hands must give very accurate results.

A method that has been advocated I do not think can give sufficient exactness. It consists in attaching a white spot to a freely-revolving wheel, such as a bicycle wheel, and photographing it whilst revolving at a uniform speed. If this speed can be made to be (say) one revolution a second, then the angle shown by the white streak will give the fraction of a second required. It must be very difficult to make a bicycle wheel revolve at any such precise speed. I have, however, when I had no other means handy, and simply wanted an approximation, attached a white pocket handkerchief to the end of an umbrella, and revolved that at arm's length as nearly once a second as counting the ticks of a watch would enable me to attain. The photograph of this, though by no means artistic, taken by the aid of a brother operator, gave a fairly correct result. Another somewhat off-hand method I have employed with good results is to photograph a passing train, broadside on, taking care that the ends of the sleepers were shown at the same time, and also that the sun was shining brightly on the train. Under these circumstances the photograph shows certain continuous streaks of equal length, produced by the sun's rays reflected from the bright points of the engine. The length of these compared with the measured distance between the sleepers gives the number of inches the train has travelled during the exposure. The rate of the train has to be determined by a friend timing it between two mile posts or other points of known distance apart, of course choosing a level stretch of rail for the whole operation, and hence the fraction of a second may be easily determined. Probably, however, the best and simplest method of all is to drop a white body from a determined height, and to photograph its fall. The method of doing so has often been described, and my description can present no novelty, but I hope to show how the necessary calculation can be facilitated, if not dispensed with altogether. I select a post or back door upon which I draw a scale of feet and inches with chalk, then get an assistant to hold a dinner plate, or circular piece of wood painted white, so that the lower edge may just touch the upper division, 0, of the scale. Then the camera, being placed in position and focussed upon the scale, the sun shining brightly upon it, a signal is given, at which the plate is also dropped, and at the same instant, or with an almost inappreciable interval of time, the shutter discharged. *En passant*, if a dinner plate be the article operated upon, it is well, in the interests of household peace, to provide a soft cushion for it to fall upon.

Upon the negative being developed, of course a blur is seen representing the course of the falling plate during the period the lens is open, and the light sufficient to have any appreciable effect; this streak will be found to commence at a certain number of inches, and to terminate at another number. It is a good plan to represent only feet upon the chalk scale, and to rule a few inches upon the ground glass focussing-screen. If one foot upon the post be made exactly to coincide with one inch on the screen, then applying a scale of inches and twelfths to the photograph, the inches will represent feet, and the twelfths will represent inches. It is also a wise precaution to see that the photograph shows the plate as having actually begun to fall, if only an inch or so before the exposure begins, to avoid the possible error due to the opening of the shutter having, through defective signalling, preceded the letting go of the plate. In practice I have found this presents no difficulty. Of course, it hardly need be pointed out that since it is the lower edge of the plate we use as our register, the width of the plate must be deducted from the top of the blur. It is equally convenient to use the top edge of the plate, and deduct the width from the bottom number of inches, as the width of the plate is always represented in the photograph. I have not tried it, but imagine a stout rod, painted white and allowed to fall, whilst lying horizontally, would be even more convenient, as its width might be neglected. So far, all is plain sailing; now comes the tug of war. Supposing, for example, the blur commences at 3 inches, and terminates at 13; the width of the plate being 6 inches, it really commences at 9 inches and terminates at 13; but to calculate the length of time it takes a body to fall from 9 inches to 13 requires some knowledge of mathematics. To obviate this difficulty I have prepared a diagram which shows the required fraction by mere inspection. The curve represents the falling body, the divisions



along the top are hundredths of a second, marked at every ten, whilst the numbers on the left hand are feet with divisions for every two inches. Taking 9 inches on the left hand, and tracing a horizontal line till it strikes the curve, we see it does so at the 22nd division, carrying on the eye till the curve crosses the 13th inch, which it does at 26 hundredths, the intervening space is four hundreds ($\frac{4}{100}$) = $\frac{1}{25}$, which is the fraction of a second during which the shutter remained open.

This is an actual example taken from a drop-shutter. The construction of such a curve presents no difficulties ; all that is necessary is to take paper ruled into small squares—what is called sectional paper is the thing—and to mark off, along the top in sets of ten each, to represent the hundredths of a second ; then down the side take six or twelve divisions to represent each foot (in the former case, of course, each division equals 2 inches) ; then fix the position of a series of points thus—on the zero division of both scales, one ; on the tenth horizontal division take a point representing 1·9 inches, on the 20th division 7·7 inches, and so on, according to the following table, which gives the total fall of a body in successive tenths of seconds :—

At 1-10th	the fall is	1·9	inches, at	6-10ths	the fall is	69·1	inches.
„ 2-10ths	„	7·7	„	7-10ths	„	94·1	„
„ 3-10ths	„	17·3	„	8-10ths	„	122·9	„
„ 4-10ths	„	30·7	„	9-10ths	„	155·5	„
„ 5-10ths	„	48·0	„	10-10ths	„	192·0	„

These successive points form the fiducial points for a curve, called a parabola, which is got by joining these points by a smooth curve, which may be done with very little error by a steady hand ; but better still, by getting a flexible lath of wood or steel, and bending it so as to make it pass through three successive points, joining those by a line ruled along the edge of the guide, and then moving it to another series of points. The diagram on page 124 has been drawn in this manner, but in order to make it sufficiently small, it only gives a small portion, and that the most useful portion, of the curve, embracing the fall over a space of 4 feet, which occupies half a second. Anyone who may not have hitherto cared to determine the speed of his shutter because of the mathematical calculations involved, will find, I hope, by the use of this diagram, that all difficulty will disappear. The error, by the use of so small a one as that given, will probably be less than one-hundredth of a second ; whilst, by making a diagram on a larger scale, even that chance of error might be much diminished, and the diagram once constructed, the process is so simple that it might be accurately carried out—I do not doubt by that proverbial *lusus naturæ*, a careful boy.

THE OPTICIAN'S INCH.

BY C. T. CHESTERMAN.

WISHING to make use of the formula published by Mr. Addenbrooke, for finding the most suitable lens to use for taking an architectural view on a given sized plate from a certain spot, I took the focal lengths from a dealer's price list, and worked out a problem in inches, but was rather puzzled to find that the theory did not answer in practice, although I previously used the rules with success. A few days afterwards, happening to alight upon the optician's list, the mystery was solved, as I learnt what may be new to many readers of the Year-Book, "that an inch is not always the conventional three barleycorns. To explain: Dealers' catalogues are compiled from the makers' price lists, but without the explanatory notes as to which inch is employed. Take, for example, the measurements used by the Rathenower Optischen Industrie (late E. Busch), they are all in old Prussian or Rhenish measures, the inch of which is slightly shorter than the English, and is divided into twelve lines. Steinheil and Son make use of the old Paris or French foot of 12 inches or 144 lines, twelve of which are longer than the English inch, the ratio being somewhat as follows:—0,97114 = Prussian 0,93829 French = 1 English. Now supposing one has a No. 6 pantascopic lens of 36 inches equal focus, and a wide angle aplanat, No. 27, also of 36 inches focus, as per makers' Catalogues, quite a different length would be expressed.

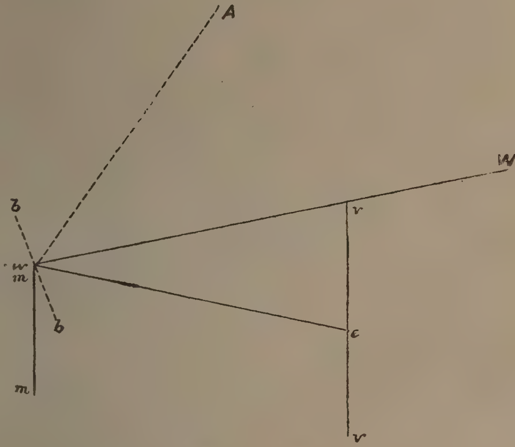
As the tables published in the News, of Messrs. Burton, Eder, and Platt, are likely to be employed more and more, I thought the above would be of use to those who, like myself, might employ the maker's data for the sake of economising time.

LIGHTING SURFACES TO BE COPIED.

BY W. E. DEBENHAM.

In copying by photography, and in copying photographs particularly, there are two difficulties to be overcome, upon the more or less thorough avoidance of which will depend the perfection of the finished result. These difficulties arise from reflection on the glossy surface, which will fill up or fog the shadows; and from the irregular or rough surface of the original, which, being copied at the same time as the image upon it, give a coarse granular appearance to the copy.

To understand the principles governing the presence or absence of the first-mentioned difficulty—that of reflection—let it be supposed that a mirror has to be photographed, and that there is some white tracery on the surface of the glass, and that this is to be distinctly seen by causing the reflecting surface to appear black, *i.e.*, without disturbing reflections. The case supposed is closely realized in the copying of a Daguerreotype, and, although less obviously, illustrates all cases where there is reflection to be avoided. Let the mirror be fixed squarely opposite the camera; an eye in the position of the lens will then see itself reflected in the centre of the mirror, and in its various other parts will see those objects reflected whose images fall upon the mirror at the same angle as, but in the contrary direction to, lines from the eye to each portion of the mirror. This fact is expressed in the well-known law of optics, that the angle of reflection is equal to the angle of incidence. A diagram may help to make matters more clear. Let *m m* be a mirror, and *e* the eye of the observer, then if a window exists in the direction W, the eye will see itself in the centre of the mirror, about the centre the face of the observer, and at *w* an image of the window, together with the various other objects which will fill up the intermediate space. All this in place of the blackness which the conditions assume as desirable and even necessary for the object required. The portion of the mirror where the image of the window is seen will appear so bright, that the white tracery on the mirror, which was to represent light on a black background, will be dark by comparison.



Now let *v v* be a black velvet curtain, with a hole at *e* for the eye to look through; the pattern traced upon the mirror will show clearly against the black background of the velvet curtain. In order that this blackness may be more perfect, and not interfered with by reflections of the pile or folds of the velvet, or by the reflections of the eye looking through the hole, let there be no source of light in front of the curtain —that is, between the planes *m m* and *v v*, if both of them were extended infinitely—but let the light come from behind the plane of the curtain over its top and round its sides.

It will be noticed that the curtain *v v* must be of such dimensions that lines drawn from the eye to the extremities of the mirror, and returned at equal and opposite angles, shall fall within the surface of the curtain; therefore if the curtain be upon the same plane as the eye, it must be of at least double the dimensions of the mirror. In practice, the dark surface must be larger than this, and for the following reasons. The mirror is assumed, and may be considered to have a perfectly plane surface. The surfaces with which we have to deal are not perfectly plane; and although the deviations from flatness may be very small, they will be sufficient to require a certain allowance. These deviations are of two kinds—first, such as may be most strikingly illustrated in a Daguerreotype, the plate of which is bent, if ever so slightly. Suppose the Daguerreotype to be so much bent that that part of it which is at *w*, lies in the direction of the dotted line *b b*, the angle of incidence would be in the direction of the dotted line *w*, A; and in order to prevent reflections from any light object being seen in the plate, and appearing as false light in what should be the shadows, the screen would have to be extended until it cut that dotted line. A picture to be copied is not likely to be as much out of truth of level as is shown in this diagram, but it is difficult to make slight variations from flatness evident in a sketch. Nevertheless, these variations occur, and must be provided for by a certain extension of the-non-reflecting surface.

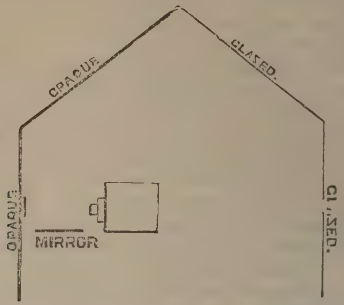
The second kind of irregularity of surface which requires the extension of the non-reflecting screen is that which arises from the nature of the surface of the picture to be copied; that is, in the case of paper pictures, each elevation caused by the grain of the paper will have a surface on one side inclined towards, and on the other side away from, the source of light. This inclination is very small, but unless it is taken into account, and if the non-reflecting screen be not large enough to include lines drawn from the lens to each part of such inclined surface and carried back at a similar angle, there will be reflections from one side of each elevation or prominence. This will produce an effect which I dare say many will remember to have seen on the top of a copy of a paper photograph, the effect of a blankety sort of texture.

The blankety texture just referred to is not to be confounded with what is known as granularity, although both proceed from the roughness or grain of the original. The former is confined to the side or top of the picture on that edge which is nearest the source of light, whereas the latter effect is visible all over. The former effect, moreover, may be got rid of by using light coming from a direction parallel to the plane of the picture—that is, what is called strong side light; whereas the general texture or grain which proceeds from the irregularities or texture of the picture copied being lighted up more on one side than the other, is aggravated by this side light (whichever side, top or edge it comes from), and is ameliorated by the light being made to come as much from the front as possible. If a sheet of rough drawing paper be held so that the light falls upon it nearly sidewise, the grain will be strongly visible; but if the light fall on its surface almost perpendicularly—say over the shoulder of the observer who holds the paper square in front of him—the grain becomes almost invisible. If the paper be held so that two equal lights fall upon it from opposite directions, the sides of the prominences that receive the least illumination from one source will receive the most from the other, and the surface will be greatly equalised. If, however, these lights be of the nature of what has been referred to as strongly side lights, there will be pits and prominences which receive more or less light, and some grain will still be apparent.

The question now arises, how is it best to carry out in practice the principles that have been discussed? First, the light must not come so much from the front as to cause reflection; second, the light must come as much from the front as possible, consistently with the first requirement, in order not to bring into strong relief the grain of the paper; third, there should be at least two sources of light proceeding from opposite directions. If a ring or circle of light could be secured coming from a direction behind and around the observer (or the lens), and at just such an angular distance as to avoid being reflected from any shining or polished part of the surface of the picture to be copied, the most favourable results should be obtained. This is very nearly the plan which was adopted and recommended long since, of laying the picture upon the ground, and suspending the camera vertically over it. Of course there must, in order to avoid reflections, be a screen on or below the camera, or else a canopy above, of the dimensions indicated by the requirements shown in the diagram.

The method of copying on the ground, however, is inconvenient, and other plans have been devised. One such plan consists in a prolongation of the camera by four rods at the corners, as far as the plane of the picture. This prolongation is surrounded by tissue paper, the sides which are nearest to the light diffuse it, and those farthest from the light reflect back a considerable amount, so that the grain is lit more or less from all sides, and is very little visible. The lens, however, receives as much light upon it or its mounting as the picture does; this light is just where it will cause the most reflection, so that the brass mounting should be provided with a tube or hood covered with black velvet. Another plan, and one that I have known adopted with success, is to cover a sheet of millboard with velvet, and fit it on the hood of the lens. With this arrangement, however, the camera should be pointed so that the light from the window or sky does not fall upon the lens, as it would, for instance, if the whole arrangement were worked parallel with and close to the window. In such a case I have seen the brass rim of the lens reflected in a Daguerreotype which had been set up to be copied. Moreover, unless a lens of long focus be employed, the screen, if large enough to be effective with all sizes of pictures that may have to be copied, will, especially when the lens is brought near the original in order to make an enlarged copy, be apt to cut off the front light too much.

The plan which I adopt is to fix the picture upon the middle of the wall of the shady side of the studio. The studio is of the ordinary central ridge kind, and the south side of both ridge and upright wall is kept opaque. The light from the whole of the opposite ridge and glazed side fall upon the picture, but reflections are in the ordinary way avoided by using a large camera, the front being more than twice as long as the picture to be copied, with a lens of long focus, of course. If the picture is so large, or the surface so irregular, that the surface of the camera is not large enough to make sure against reflections, a background screen may be placed behind it. This, if so far removed from the picture as to receive light from the top or ridge light of the studio, should be tilted forward sufficiently to prevent that ; or a simple plan may be adopted—that of placing something upon the camera just high enough to cut off reflection.



The light as arranged falls very much from the front, and from a considerable surface—twenty-four feet in length, twelve on each side of the camera—so that the grain of the paper is not very evident. In order, however, to make it still less so, a mirror is placed horizontally below the picture between it and the camera. A sheet of white card may be substituted as more convenient than the mirror, but is not quite so good.

What has been said has reference principally to copying photographs upon paper, and for other subjects some modifications may be necessary or desirable. Oil paintings and artistic designs generally are produced with the light coming over the artist's left shoulder, and the painting may show less grain when lit up from the same direction as that in which it has been painted, than when equally lighted from all directions. In this case, while what has been said as to the avoidance of reflections will still apply, the direction of the light may be altered to what is required, by blinding one-half (the right) of the studio, or by copying in the length of the studio instead of its breadth. With Daguerreotypes, again, it will generally be desirable to place them upon their side, as the polishing of the plate (except those of the stereoscopic form) was in the direction of lines across the picture. If anyone hold a Daguerreotype under a vertical light and change its position as indicated, he will observe a great difference in its brightness.

Naturally the less grain there is upon the surface of paper photographs, the less there will be to be copied ; and an obvious preparation for copying is to roll the print well if the surface requires it.

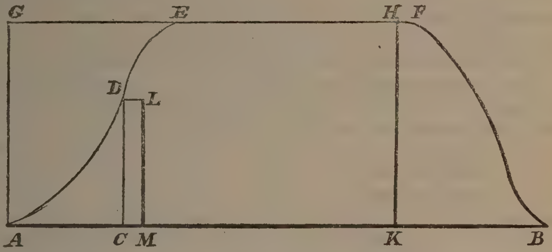
NOTE ON THE MEASURE OF INSTANTANEOUS EXPOSURE.

BY J. W. MARSHALL, M.A.

The value of an exposure with a given lens and stop is usually represented by stating its duration. Owing, however, to the fact that no mechanism can be devised to admit and shut off a beam of light absolutely instantaneously, the duration of an exposure is never a perfectly correct measure of its actinic effect, and in the case of so-called instaneous exposure is not always an approximate measure of that effect.

Unless a shutter be used which works in the plane of the diaphragm, the exposures of different points of the plate are not, in general, equal ; hence, in order to be accurate, we must confine our attention to one particular point at a time, and, to fix our ideas, shall consider the exposure of the centre of the plate.

The best method of representing the variation during exposure in the amount of light admitted to the point of the plate considered is by means of a diagram constructed as follows :—



Take a horizontal line A B, and let distances measured from A to the right represent on any scale we please times from the commencement of exposure, and let A B represent the whole duration of exposure. Let a curve A E F B be so drawn that the perpendicular D C from any point D in it on A B is proportional to the illumination at the instant denoted by the point C. Assuming that the actinic effect of any constant illumination is proportional to its intensity and duration jointly, the effect of an illumination C D lasting for a time, C M is represented by the area of the rectangle D C M L, and the effect of the varying illumination given by the action of the shutter is represented by the area included between A B and the curve A E F B. Most shutters are so arranged that during part of the exposure no light is being intercepted by the shutter, in which case the curve, as defined above, will consist of a straight portion E F parallel to A B and curved portions A E, F B representing the manner in which light is admitted and shut off.

If, now, A K be taken so that the area of the rectangle A G H K is equal to the area A E F B, the breadth, A G, representing the full illumination when none of the light is stopped by the shutter, the time represented by A K is a true measure of the exposure. This time may be defined without reference to the diagram as the duration of an exposure which would have the same effect as a given one, supposing the shutter to open and close absolutely instantaneously. In what follows I shall, for shortness, call this time the "equivalent exposure."

It is at once obvious that the more nearly the whole exposure is equal to the equivalent exposure, the more efficient is the shutter from an optical point of view.

If the form of the above curve could be found for any shutter and any point on the plate, or if only the whole exposure and equivalent exposure could be calculated for any point, we should have at once the best possible means of comparing the optical merits of different instruments; but, unfortunately, in the case of the majority of shutters, this cannot be done. In the case of a simple drop shutter working without friction (which can be so much reduced as to become a negligible quantity if suitable methods of construction be adopted) the motion of the drop can easily be calculated, and hence the diagram drawn. Remembering that so far as the exposure of any one point of the plate is concerned the office of the shutter is to admit and shut off a beam of light whose diameter at the usual position of the shutter immediately in front of the lens does not differ much from the diameter of the stop used, formulæ can easily be found which give approximately the values of the whole exposure and the equivalent exposure.

Let $2r =$ diameter of stop.

$h =$ height of lower edge of aperture of drop above axis of lens, when set ready for exposure.

$a =$ vertical length of aperture in the drop.

Then since exposure of centre of plate begins when the drop has fallen a distance, $h-r$, and ends when it has fallen $h+r+a$, we have

$$\text{Whole duration of exposure } \sqrt{\frac{2}{g}}\left\{\sqrt{h+r+a}-\sqrt{h-r}\right\}$$

Each particular ray of the beam of light we are considering passes to the plate during the time the aperture of the drop takes to cross its path, and this time is slightly greater for rays above the central one, and slightly less for those below, than it is for the central ray itself; but we shall obtain a very approximate value of the exposure by supposing each ray to pass for the same time as the central one, and hence we have

$$\text{Equivalent exposure} = \sqrt{\frac{2}{g}}\sqrt{h+a}-\sqrt{h}$$

If we express h, r, and a in inches, and time in seconds, we may write these two formulæ

$$\text{Whole duration of exposure} = \cdot 072+\left\{\sqrt{h+r+a}-\sqrt{h-r}\right\}\text{seconds.}$$

$$\text{Equivalent exposure} = \cdot 072+\left\{\sqrt{h+a}-\sqrt{h}\right\}\text{ seconds.}$$

As a numerical example, suppose $h = 1{\cdot}5$ inches, $r = {\cdot}25$ inches, and

$a = 2{\cdot}25$ inches, we shall find whole duration of exposure $= {\cdot}068$; equivalent exposure $= {\cdot}056$.

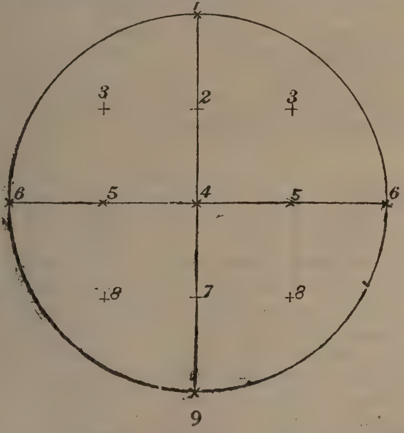
It is clear, that by making h and a large, compared with r *i e*, by using large aperture and long drop, the two expressions found above may be made nearly equal, and the shutter will approach in efficiency to the ideally perfect form, opening and closing instantaneously.

On the other hand, the formulæ show the fallacy of attempting to get great rapidity by diminishing excessively the aperture of the drop. For if we take an extreme case, and suppose the aperture reduced to a mere slit, so that both h and $h + a$ approach the same value, say k, we see that, although the equivalent exposure (and therefore the light admitted) may be made as small as we please, yet the whole duration of exposure cannot be made less than $\cdot 072 \times \left\{\sqrt{h+r} - \sqrt{k-r}\right\}$.

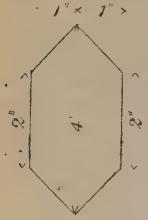
INSTANTANEOUS SHUTTERS.

BY ASSAM.

In most instantaneous shutters the amount of light admitted varies on different portions of the plate, and in some it varies much more than most persons think. In investigating this I have, to save trouble, taken the opening behind the shutter as one of two inches diameter, and I have neglected friction. First,—I take the ordinary drop shutter. The velocity of this varies from moment to moment, gradually increasing from a slow to a rapid pace, so that all parts of the aperture do not receive the same amount of light, and it makes a considerable difference whether the exposure commences immediately, or some time after the shutter has commenced falling; and it also varies with the shape of the opening of the shutter.

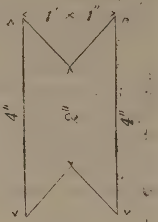


I take the following openings :—
(*a*) Two inches square.
(*b*) Four inches high by two inches broad.



c

(*c*)
(*d*) As in sketches.



d

Then light will be admitted at the points shown in the diagram on last page for the space of time (seconds) shown below.

	1	2	3	4	5	6	7	8	9
a	·102	·063	·063	·053	·053	·053	·047	·046	·042
b	·144	·102	·102	·089	·089	·089	·089	·089	·074
c	·144	·102	·072	·089	·065	·047	·081	·059	·074
d	·063	·053	·084	·047	·072	·102	·042	·065	·039

In *a b c*, the moment the shutter begins to fall the exposure commences. In *d* the shutter falls half an inch before the exposure commences.

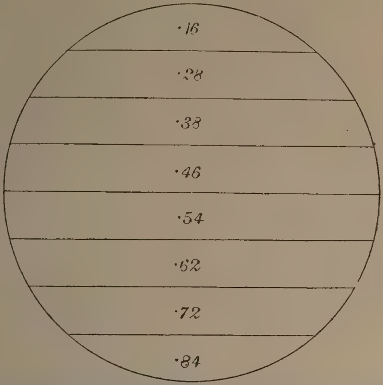
If the shutter falls two inches before the exposure commences, then, with the same openings, the result will be—

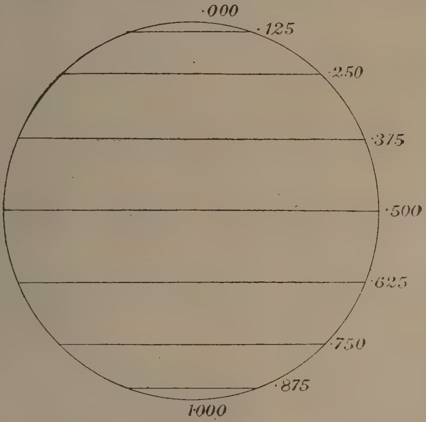
	1	2	3	4	5	6	7	8	9
a	·042	·039	·039	·036	·036	·036	·034	·034	·032
b	·074	·070	·070	·065	·065	·065	·062	·062	·059
c	·074	·070	·049	·065	·046	·032	·062	·044	·059
d	·044	·039	·059	·036	·055	·074	·034	·051	·032

From these two tables several things may be seen : first, the illumination is much more even if the shutter drops some distance before the exposure begins—even so small an amount as two inches. Secondly, this even illumination is also obtained, but not to the same extent, by increasing the length of the opening. Thirdly, in my opinion, any fancy-shaped opening will lead to unequal illumination over the aperture.

The second form of shutter is that which rises and falls in front or behind the aperture by means of a revolving wheel. The shutter may be single or double, and in the latter case the opening takes place from the centre. I take the former case first.

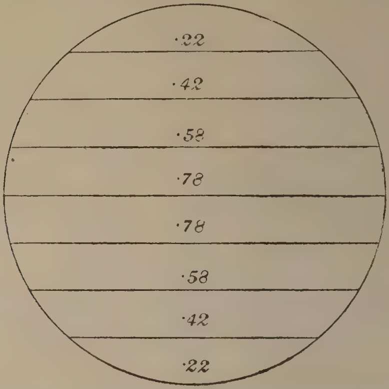
The shutter being closed, then, as the wheel revolves it rises gradually at first, and then more rapidly, until it has completed a quarter revolution, when the rate of lifting decreases until a half revolution is complete, when it begins to descend. From this it is evident that the lower portion of the aperture receives much more light than the upper.

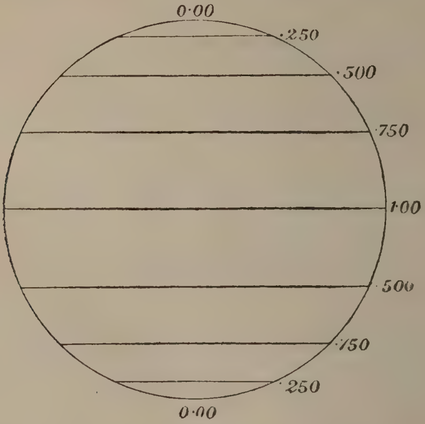




I give two diagrams to show this: the maximum amount of light admitted being unity. The first diagram shows the approximate average amount admitted to successive strips a quarter of an inch wide, and the other the positions of the lines in the aperture which receive $\frac{1}{8}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{1}{2}$ $\frac{5}{8}$ $\frac{3}{4}$ $\frac{7}{8}$ of the maximum amount of light.

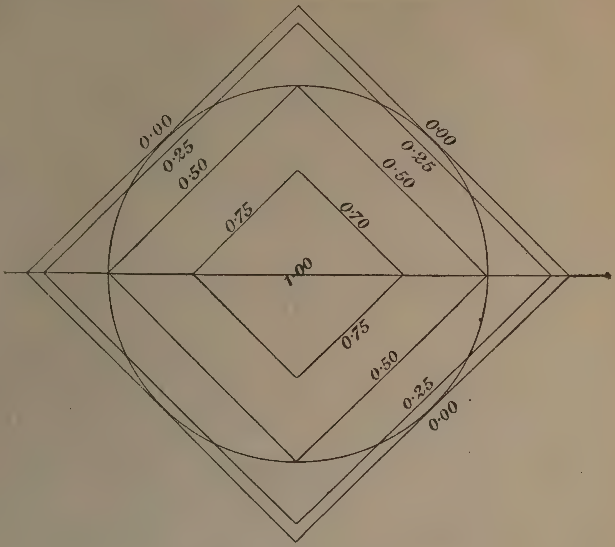
Third.—The double shutter acts by two shutters opening from the centre, and closing again by the revolution of a wheel. Each half of the opening then receives light at the same rate as the whole aperture did in the last case, and I give similar diagrams to the last.



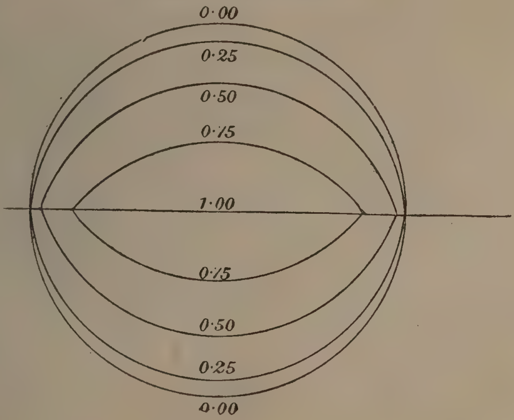


The openings may be diamond shaped or circular instead of square, and the exposure will be the same on any similar strip.

If the shutter, instead of rising vertically in a groove, rotates like a flap, the amount, of light will be the same in both cases.



Diamond-shaped Opening.



Circular Opening.

Another form is a flap which rises and then releases an ordinary drop shutter, and this gives unequal illumination, as the exposure at the bottom of the aperture must be much longer than at the top.

To sum up. First :—No drop shutter can give equal illumination over the whole aperture. But if the opening be twice or three times the aperture, and the shutter drops a few inches before the exposure begins, the illumination will be practically uniform.

Second :—No shutter which travels from one side of an aperture and then returns, first opening and then closing the aperture, can give equal illumination, whether the shutter moves at a uniform speed or no.

Third :—The same applies to any shutter opening from and closing to the centre ; but in this case, if the rise and fall of the shutters is over a longer space than the aperture, this inequality of illumination will be lessened ; still, even then it will be more unequal than with an ordinary drop shutter.

Fourth :—The only form which will give equal illumination over all portions of the aperture is if a shutter travels at any speed uncovering the aperture from one side, and is followed by another shutter at any interval travelling in the same direction and at the same speed as the first, closing the aperture.

Most pictures do not require the same amount to be admitted to every part, as the foreground usually requires more than the centre, and that more than the sky ; but as the position and shape of these parts varies, it would be impossible to get a shutter to suit all subjects. But varying the speed of the shutters independently of one another and their shape, some improvements may be made, but it would probably lead to complications.

I think it would be better to have a shutter which gives an equal or nearly equal amount of light to every portion of the aperture, than one which gives a much larger amount to one portion than another.

Friction has been entirely neglected in these investigations, but it would rather tend to increase than to decrease the irregularity.

I was led to make the above investigations from the following cause. Having a 10 by 8 camera, and working with three lenses which had often to be changed, it was much more convenient to have a shutter behind the lens, than to adapt it to all three. A drop-shutter behind the lens gave more exposure to the sky than to the foreground, and if it fell some inches before the exposure began, it would be bulky, and there was not room for it to drop. No india-rubber would stand the tropical climate, and I could not find any shutter which would suit my requirements, which were :—

1st. Work behind the lenses.

2rd. Be fairly compact.

3rd. Admit an equal or nearly equal amount of light to every part of the plate.

4th. To work at a rapid or moderate speed at will, and without vibration.

5th. To have no india-rubber.

6th. Constructed so as not easily to get out of order in a tropical climate with rough usage, and to be easily repaired.

7th. Last, but not least, it must be moderate in price.

Appendix.

Table showing the time in seconds which a body takes to fall from rest to any point up to ten inches by tenths of an inch—

ins.	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
0	0·000	0·023	0·036	0·044	0·046	0·051	0·056	0·060	0·064	0·068
1	0·072	0·075	0·079	0·082	0·083	0·088	0·091	0·094	0·096	0·099
2	0·102	0·104	0·107	0·109	0·101	0·114	0·116	0·118	0·120	0·122
3	0·125	0·127	0·129	0·130	0·133	0·135	0·137	0·138	0·140	0·142
4	0·144	0·146	0·147	0·149	0·151	0·153	0·154	0·156	0·158	0·159
5	0·161	0·162	0·164	0·165	0·167	0·169	0·170	0·172	0·173	0·175
6	0·176	0·178	0·179	0·181	0·182	0·184	0·185	0·186	0·188	0·189
7	0·190	0·192	0·193	0·194	0·196	0·197	0·199	0·200	0·201	0·202
8	0·203	0·205	0·206	0·207	0·208	0·210	0·211	0·212	0·214	0·215
9	0·216	0·217	0·218	0·219	0·220	0·222	0·223	0·224	0·225	0·226
10	·0227									

Table showing the distance in inches and decimals which a body falls (starting from rest) in any time from 0 to ·250 of a second by ·005 of a second.

seconds.	inches.	seconds.	inches.	seconds.	inches.	seconds.	inches.	seconds.	inches.
0·00	·0000	·050	0·479	·100	1·930	·150	4·344	·200	7·723
·005	·0048	·055	0·584	·105	2·129	·155	4·638	·205	8·303
·010	·0193	·060	0·695	·110	2·336	·160	4·943	·210	8·515
·015	·0434	·065	0·816	·115	2·553	·165	5·244	·215	8·925
·020	·0772	·070	0·946	·120	2·780	·170	5·558	·220	9·280
·025	·1207	·075	1·086	·125	3·017	·175	5·913	·225	9·775
·030	·1737	·080	1·235	·130	3·263	·180	6·255	·230	10·241
·035	·2365	·085	1·395	·135	3·519	·185	6·609	·235	10·663
·040	·3089	·090	1·563	·140	3·784	·190	6·970	·240	11·133
·045	·3910	·095	1·742	·145	4·059	·195	7·359	·245	11·590
								·250	12·067

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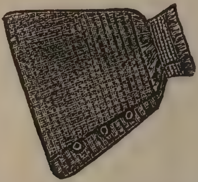
Jottings.

Those who wish to preserve the wrist gear from being soiled, would do well to wear artists' cuffs while developing. We take the idea and the cut from an advertisement in which Anthony and Co., of New York, offer the cuffs at sixty cents. a pair; but our readers need not go so far as New York to obtain them.



The suggestion about wearing cuffs should be especially acceptable to women photographers, a rapidly-increasing class.

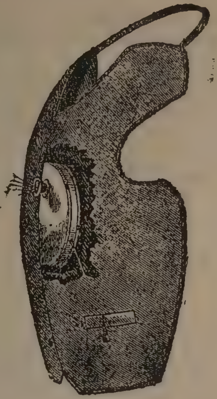
If photographers want to revive the rage for being photographed, let them turn their attention to the devising of novelties in which to display the photograph. The latter, now-a-days, is simply an adjunct, a trifle to set off its surroundings. It no longer occupies the place of self-importance. Witness, for instance, the latest idea—a fan, in which there is an arrangement by which the owner's photograph, or anybody else's if she chooses, can be attached, and so form a part of the ornamentation!

The halation produced by the reflection of light from the back of the glass plates employed in photography has always been considered a nuisance by photographers, inasmuch as it causes objects from which a large amount of light proceeds—as windows in an interior—to be surrounded with a glare or haze of light.

In connection with instantaneous exposures, however, it appears possible that this reflection may be of advantage in adding to the total effect produced upon the sensitive silver salt in the film with which the glass is coated. When the back of the glass plate is coated with a dark substance, the rays are mostly absorbed, and halation is prevented; and for long exposures upon objects which vary greatly in the amount of light they send to the lens, this course is very advisable. But for rapid—instantaneous—exposures on average subjects, it certainly may be the case that the reflection of light from the back surface of the glass aids in giving detail and density.

If this be true, the coating of the back of the plate with some substance which *reflects* light powerfully—as white paper, or even by silvering the glass temporarily—ought to heighten the effect. White paper brought into optical contact with the glass by means of a little glycerine would be the simplest method.

Here is a sketch of the American vest camera, an apparatus to which we have referred several times. We fancy, however, that a man wearing it would look so remarkable as to attract some attention; but possibly a flat-breasted woman might wear a concealed camera in a similar way without being noticed. The gelatine plate is circular, and after each exposure it is turned one-eighth of a circle, so that one gets eight pictures on a plate. The act of removing the cap and replacing it is scarcely likely to be noticed, as the cap is made to look like a button. This latest form of a detective camera does not seem to have been introduced into the London market.



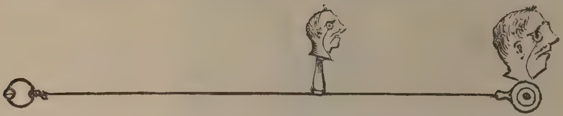
Photography is not unfrequently brought in to assist the commercialist in his barefaced, brazen, and generally unrebuked lies. So accustomed are we to such statements as "Brown's bitters are the best," "Jones' jam is the finest," or "Robinson's reviver is unsurpassed," that only too many persons pass it over without a thought as to the unpleasant things said about liars in a book which they—and possibly Brown, Jones, and Robinson also—profess to believe.

But a word regarding the particular photograph that has suggested to us the above remarks. It is a procession of bicycle riders: all but the one who is first appearing to labour heavily, while the leader appears quite at his ease; indeed, he has his hands off the bar, and is in the act of lighting his pipe. Under the photograph one reads: "The finish of a ten-miler, X—'s new bicycle first!" The bicycles libelled by the joint conspiracy of commercialist, riders, and photographer, are easily recognisable machines, and of well-approved patterns. There is some cleverness about the photograph, and it was evidently taken while all the machines were going at the slowest possible rate.

Probably the manufacturers of the bicycles shown in the rear would have the same legal remedy against the untruthful commercialist as Maignen expects to have against Clark in the case referred to in the following extract from a paper of last year:—"An application was made to Mr. Justice North, in the action of Maignen v. Clark, to restrain an alleged trade libel contained in an advertisement that the defendant's filter was the only filter taking a medal at the South Kensington Exhibitions. The plaintiff is the proprietor of the "Filtre Rapide," a process of filtration that obtained a medal, and the defendant trades as the "Chamber and Pasteur Filter Company. The judge granted an injunction until the trial of the action.

Cases like the Belt prosecution, and the case above referred to, seem to indicate that the law tends to interfere more and more in the case of misrepresentation by vendors.

As a copying instrument, the pantagraph is somewhat complicated and expensive, but a surprisingly simple substitute is now being sold in the novelty shops of London. The arrangement in question, which has been invented by Rudolf Daum, of Vienna, is called the mechanograph, and consists of an elastic cord which is fixed at one end, while at the other end is a pencil. At any point between the fixed end of the elastic cord and the pencil end there can be fixed a light metal pointer. The action of the arrangement now becomes clear. Holding the pencil in the hand, the cord is stretched so as to bring the pointer on some part of the original sketch to be enlarged, after which the pencil is pressed against the paper while the pointer is made to travel over the lines of the original. Accuracy in reproducing depends mainly on holding the pencil upright.



"I took up portrait photography because I wanted exercise," said a portly gentleman the other day to a friend. "You mean landscape photography," said the other. "Oh, no, I do not. I've no time for country excursions, but I can always snatch an hour at home. You see, the room which does best for a studio is at the top of the house, while my dark-room—the wine cellar—is at the bottom. There are four flights of stairs between the two, and I get jolly fine exercise running up and down. I've certainly lost a stone weight since I started photography." If this be true, Dr. Abernethy's advice to a gouty patient to carry a scuttle of coals up three pairs of stairs twice a day will become obsolete. "Try photography," will be the new remedy.

Tatooing is, it seems, becoming a popular art in the United States; and it is said that both a man so tattooed as to represent a "dude" in evening costume, and another who is covered with views of Salt Lake City, are making a handsome income by charging a dime to each spectator. This is not the best of it, as few visitors fail to buy a cabinet photograph, for which a "quarter" is charged. The capital cost of the exhibition—that is to say, the tattooer's fee—is said to have been 250 dols.

When a person is describing any inordinately complex piece of apparatus, it is remarkable how frequently he uses the word "simply." This remark was made at a recent meeting, at which an "inventor" was contending with the complications of a roller slide he had just constructed. At each effort he remarked, you "simply" do this, or you "merely" do that.

The decision in the Belt case should—if, indeed, one may hope for such a thing—open up a new field in commercial morality; but reform is, perhaps, no more needed in photographic circles than elsewhere. It would, perhaps, rather astonish the next exaggerative vendors of a photographic business if the purchaser, instead of adopting the ordinary plan of declining to buy, adopted the course pursued in the Belt prosecution.

Photography often discloses the inartistic points of a fashion in dress. Personal grace and charm may lead one to overlook ugliness, but the unyielding lens has no such weaknesses. As ladies' hats—high enough already—are this season to be higher than ever, we suggest that a Bill be introduced into Parliament, compelling every lady who buys a high hat to be photographed in it, so that she may be made conscious of its absurdity. M. Blanc, ex-Director of Fine Arts, Paris, is of opinion that from an artistic point of view there is no objection to high head gear so long as it is perfectly distinct from the head. If the hat or bonnet is so arranged that with the hair and face it gives the appearance of a structure all of a piece, it is then so clumsy and so voluminous that, in spite of the most elementary laws of human proportion, the head becomes the fifth, and sometimes the fourth, part of the whole person. Hence all the more necessity for photography to come in as a wholesome corrective. A photograph of the full-length figure showing this disproportion would be quite convincing.

In the days of collodion an east wind was reputed to double the necessary exposure. The rhyme has it :—

"When the wind is in the East,
Double exposure at the least."

Are our gelatine dry plates affected in this way? We have not found it so, other conditions being equal.

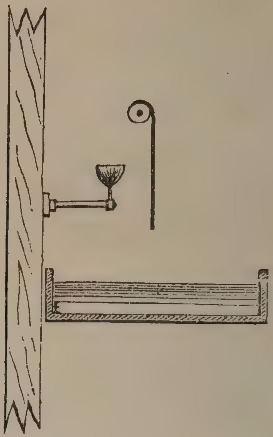
The photographic effects of lightning have long formed one of the "curiosities of science." The industrious Mr. Timbs, in his collection of scientific anecdotes, gives several instances of pictures of branch-like markings being formed on the bodies of persons who, when struck by lightning, have been standing for shelter under trees. Unfortunately, the absolute identity of the lightning picture with the object said to be photographed has never clearly been made out, and a case lately mentioned in the *Athenæum* throws great doubt on the theory. In this instance, leaves were distinctly traced on the body, but as distinctly also was it found that they were reproductions of the folds of a charred under-vest.

It is said that the adhesive qualities of gum may be very much exalted by the addition of aluminium sulphate (the so-called "patent" alum) to the mucilage. "Two grams of crystallised aluminium sulphate," says an abstractor in the *Chemical Society's Journal*, "dissolved in 20 grams of water, is added to 250 grams strong gum-arabic solution (2 grams in 5 grams water). Ordinary solutions of gum-arabic, however concentrated, fail in their adhesive power in many cases, such as the joining together of wood, glass, or porcelain; prepared, however, according to the above receipt, the solution meets all requirements."

The Royal Geographical Society has, to use the words of the announcement, "taken a step which may be expected to add materially to the value of the records of scientific travel." It has determined that in futuae its agents shall be photographers, and, for this purpose, it has appointed an instructor in photography. We are very glad that such a step has been taken, but must confess we have little faith in the Geographical Society. There is no scientific organisation in London which contains so many unqualified members. The payment of a subscription entitles one to place the letters "F.R.G.S." after his name, and it is a notorious fact that there are hosts of persons parading the "distinction" whose knowledge of geography would be put to shame by an average Board School child.

Those who have to tone many prints, and wish to turn them out without much variation in tone, may do well to adopt a plan which we saw in operation at the printing works of the London Stereoscopic Company.

An opaque blind hangs so as to screen the eyes of the operator from all direct light; and, moreover, this screen is so placed as to shade about one-third of the slate tank in which is the toning solution. The toning is invariably done by gaslight. In reply to a question, the toner informed us that it would be impossible to get such a uniform tone by working in daylight, and that, when a slate tank is used, the strain on the eyes is far less than if a white dish were used.



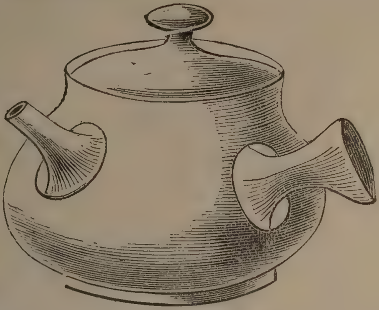
"I am glad to hear that you consider this the best picture I ever did," said D'Arcslyde, while he, with an air of conscious superiority, elevated himself before the mild critic Jones. "Yes," was the reply, "but it is a fearfully bad production, for all that."

This American story reminds one of Jerrold, who was seriously disappointed with a certain book written by one of his friends. This friend heard that he had expressed his disappointment. Friend to (Jerrold): "I heard you said —— was the worst book I ever wrote." Jerrold: "No, I didn't; I said it was the worst book anybody ever wrote."

Among those uses of glass which are a pretty direct outcome of its cheapness, may be mentioned its employment as a flooring material in business houses where light is scarce.

In the YEAR-BOOK for 1885, this idea of using glass flooring was referred to by A. Borland, he telling how he had made a portrait studio in which all the top light came through the glass floor of the room above. Slabs of glass about an inch thick are strong enough in ordinary cases.

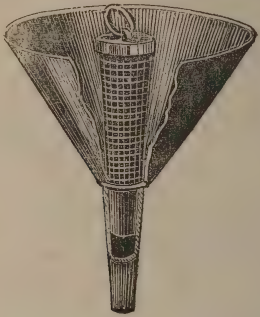
The tea-pot has, of late, been the vessel most commonly used as an emulsion pourer in coating gelatino-bromide plates, but the usual commercial forms have their drawbacks. One of these is the position of the handle—the wrist becoming strained by continually reaching round to a point opposite the spout. The Japanese tea-pot represented by our cut is made of non-absorbent porcelain, and it was purchased at a large draper's in Holborn at a cost of a farthing under sixpence.



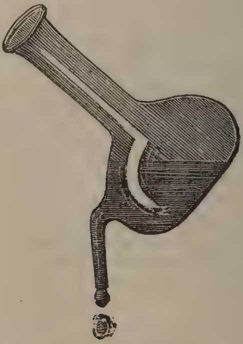
A favourite pastime at juvenile parties in America is the photographic album. A large frame with a cover on hinges represents the album. The outside is covered with red cloth, while inside is an oval mat, with an opening sufficiently large to admit a life-sized head. The young folks then dress up in various characters, and are exhibited one by one through the opening, the album lid being closed between the exhibition of each picture. Of course means have to be adopted to conceal the lower portion of the figure, but this can be easily contrived. The use of the magnesium light gives, it is said, quite a photographic look to these human pictures.

It is not easy to say what an artist may want in the way of "properties." We were in company recently with a well-known artist engaged on an equally well-known illustrated paper. He wanted a bishop's shovel hat for a special picture, and together we journeyed to a clerical hatter. "Have you a bishop's hat ?" he inquired of the shopman. "Oh, yes, sir," replied the latter, and was moving away to get the article, when the artist unfortunately added, "I want to make a sketch of one, if you will allow me." The expression of the man at once altered. A customer who wanted to buy a bishop's hat must be somebody ; an artist who only wanted to look at one, was nobody. "Ah ! we have not got one in stock," coolly remarked the shopman. What could be said in reply to this ? Of course we could not contradict the man, so we had to make the best of our way to the nearest photographic dealer's. But bishops, apparently, do not like being taken in their hats, and we turned over a pile of photographs without finding one. The artist was in despair, when luckily he remembered he had bought a photograph of a hatted bishop for a penny several months before from a dealer in the street. "Odd, isn't it?" he remarked; "I recollect now when I bought it I thought I was wasting a penny; but I have since learnt that every verification of detail in costume, no matter how trivial, is of value, and a photograph is almost as good as the real thing."

Butterfield's funnel strainer is shown in the cut. It is an American contrivance, and we do not know whether it is to be obtained in this country. The strainer is made of wire cloth rolled into a tubular shape to fit tightly in funnel tubes of different sizes, the upper or larger end of the strainer being closed by a metal cap, which is provided with a ring or knob, by which the strainer may be conveniently handled when not in use. The lower end of strainer is open. For photographic purposes it may be made of silver, and may be wrapped round with fine muslin or lawn.



Another American invention, for the cut of which we are also indebted to the *American Druggist*, is Salleron's drop counter. No description, other than the drawing, is required.



Among the phases of photographic business which may be quite right and above board, but which have a slightly discordant twang about them, may be mentioned the rapidly-extending system of special privilege prices. On the same day we received two circulars, one telling us that as a member of the Cyclists' Touring Club we could get any number of orders for portraits at something like half the usual rates; and the other pointing out that a similar advantage attended membership of the Society of Arts.

In the days of the Daguerreotype reversed photographs were common, as a prism or other kind of reflector had to be adapted to the lens when a picture was required true, in the sense of having the right hand to the right, or the left hand to the right. Now, indeed, it is rare to see the name of a photographer, who has any reputation to lose, to a reversed print, especially if the print represents, or is supposed to represent, any historical scene or matter of fact.

When Daguerreotypes were often sent out reversed, the mayor of a town—rumour is double-tongued as to the town, Neuchatel and Bristol are both mentioned—was going to be photographed while seated on his horse of state. "Turn towards the tail," said a waggish bystander, "as, don't you know, a Daguerreotype comes out the wrong way"; and turn towards the tail he did. So the story goes, but we have not seen the photograph.

Brandel's photo-revolver is an apparatus about the size of an ordinary stereoscope, and which can be used with the greatest facility.

So simple is its management, that it is said that even the Great Czar—a by no means successful photographic amateur, as photographic amateurs go—has attained a proficiency in its use, and found in the "photo-revolver," which he took about with him everywhere, a source of amusement and distraction even during that *mauvaise quinzaine,* when his cousin Alexander was seemingly defying him in Bulgaria.

But though the manipulation of this new photographic toy tended at times to soothe the Czar's perturbed spirit, it also had a contrary effect on the Imperial temper when the "photo" would not "revolve," or the "revolver" would not "photo," and it is whispered in Russian Court circles that it was after making five ineffectual efforts to "take" a ball thrown into the air by his aide-de-camp that Alexander indited that particularly rude and bearish telegram to the Prince of Bulgaria, at which all Europe wondered.

"Do I find the camera useful?" said an artist recently, repeating our question. "Well, I tried photography when I was sketching in the north, but was always disappointed. Somehow a photograph fixes you, and you haven't got the same licence as you have when you use the pencil. Besides, my experience was very annoying. You see, I took a number of photographs of the people—Angus McPherson, Jeannie McIntosh, and a lot of other Mc's—and I thought, at any rate, they would be useful as figure studies. Well, I put the box of negatives away in my travelling trunk, and, when I got home, set to work to develop. And what do you think I found? Why, every one hopelessly fogged. I found out the reason afterwards. The girls of the house were so mighty curious to see how they would come out, that they got to my travelling trunk in my absence, and opened the negative box. I fancy they didn't think much of my photography when they found they could see nothing. I have never meddled with photography since."

In considering the question of the permanency of prints, the main question is to clearly distinguish between methods which can certainly give permanent results, and processes in which the results may be permanent if this, that, or the other precaution has been duly attended to by the manipulator.

Under the first heading come most prominently the various pigment processes, methods by which a ready-made colouring matter is entangled by indirect photographic means, and forms the image. The selection of a permanent pigment is an easy matter, and, in the finished prints, we may have every degree of goodness and badness, according to the skill or stupidity of the operator, but equal permanency; and the possessor of a print may—provided he is satisfied that permanent pigments have been used—cast aside all suspicions as regards that individual print, as distinguished from others of its kind.

In the case of prints made by the action of light on silver salts, this is not so. The possessor may feel it to be a well-established fact that a few prints nearly as old as photography itself, and in a fair state of preservation, are shown; but, when shown, are shown as altogether exceptional articles. He knows that the bulk of silver prints, made even ten years ago, are going or gone, and that there are cases in which the picture has yellowed in a fortnight. In considering any picture he values, he may look at his print and reflect: "Yes; if it was thoroughly fixed in fresh and neutral hypo, and the washing was thorough—thorough enough to clean out every trace from under the blister, of which I see a sign just there—and if, moreover, it was neither dried in blotting-paper containing hypo, handled with hypo-contaminated hands, nor mounted on a card contaminated with this substance, it may, perhaps, be as permanent as those that have survived forty years or more. After this long series of "ifs," there is some hope.

Take, on the other hand, the man who looks on a print which he knows to be made with such pigments as have been found undamaged in the Pyramids of Egypt, he may reflect: "The manipulation may have been careless—indeed, it certainly has, there is evidence of this on the face of it—the print may be made on paper which will become yellowish by age, there may even have been added a little fugitive red pigment, to give warmth of tone; but, as regards the picture itself, I may look confidently forward to the certainty of it never fading."

As examples of the best known pigment processes, we may mention collotype methods, the so-called "carbon" processes, due to the labours of Pouncey, Fargier, Swan, Johnson, and others, usually known in this country as "Autotype," the dusting-on methods, and the various phototypic and photolithographic methods.

"What is wanted in photography now-a-days," said one enthusiastic amateur to another, "is a still more simplified process; a sort of universal *tria juncta in uno* business, you know—a liquid that will be at once a sensitizer, a developer, and a fixer." "Oh, but that's impossible," said amateur No. 2. "I'm not so sure about that," replied amateur No. 1; "greater apparent impossibilities have been overcome. For instance, would you believe in a liquid which was at the same time, and without the least alteration, a hair restorer, a cure for rheumatism, and a furniture polish?" "Of course I shouldn't. You are chaffing." "Never was more serious in my life. Such a mixture could be bought years ago, and, for anything I know to the contrary, may be bought now. The acting ingredient was turpentine, and that, you know, is good for the hair, for rheumatism, and for furniture." "I see; and what ingredient do you suggest which would serve for a sensitizer, developer, and fixer?" But this question the enthusiastic amateur could not answer.

A suburban photographer was the cause lately of unintentionally putting one of his sitters in a terrible fright. The sitter was a pretty young lady, and she only wanted one copy carte size. The photograph turned out to be an excellent one, and so pleased was the photographer with his work that he could not resist the temptation of exhibiting it in his show-case. He would have asked the sitter's permission, but he did not know the address, for she had called for her copy. The photograph had not been exposed to view a week, before the young lady called in utter distress, and begged him to remove it from the case. Of course he at once acceded, but not before she had, with many blushes, explained the reason. She had had her photograph taken to give to a young gentleman to whom she was engaged in opposition to the wishes of her family, and as she did not live far away, it was more than likely that the photograph in the case would be seen by some friend or relative, and what explanation could she give? The photographer, like a gallant man, expressed his sympathy, and was rewarded with a grateful smile. Whether the course of true love eventually ran smooth he never knew. It was one of those little episodes with a tinge of romance which occur to every photographer in the course of his experience, and that was all.

Mr. D'Arcslyde, so long recognized as one of the leading high-class portraitists of a fashionable neighbourhood in the West, was one day called down by his reception room lady to see the Countess of Clovermere, one of his oldest and best customers. The Countess seemed strangely moved—indeed, almost angry—as she handed him some portraits of her children, and told him how much she was surprised that *he* should send out portraits like these. Mr. D'Arcslyde at once perceived that the offensive portraits had not been sent out from his studio—the cards, indeed, bore the imprint of the three-for-two-shillings firm that had recently established itself near at hand—but it took some little while to make the Countess clearly see that her nurse had taken the children to the wrong place, and even then she felt angry, for had not Mr. D'Arcslyde been the first to humiliate her by pointing out that she had come to complain of work which bore a strange name? Had he not shown her how unobservant she had been?

D'Arcslyde's troubles did not end with the loss of the custom of the Countess and of those of her numerous friends to whom she had discoursed about his recent bad work, as every now and then this troubled photographer would send work home with the account, and instead of payment he would merely have the advertisement of the three-for-two-shillings firm flourished in his face, with such a remark as "You call this business, do you?" In fact, there is a constant Comedy of Errors played between Mr. D'Arcslyde's studio and that of the three-for-two-shillings firm.

All this is fast tending to make Mr. D'Arcslyde a sad and misanthropic man. He will not so far lower his standard as to ask for money in advance, neither will he fix up a sign disclaiming any connection with the house a little farther along the road; but this he does: he carefully looks at each sitter, and if he concludes it is one of those attracted by his neighbour's advertisements, he declares that the day is unsuitable. Still he sometimes makes a mistake, and sends away good clients.

The pinhole camera may be described as the simplest possible photographic camera, but New World ingenuity has put on the market an interesting item : camera and dry plate complete, and a new camera for every dry plate exposed.

This latest simplification of the photographic apparatus consists of a quarter-size gelatino-bromide plate in a paper case, the two ends of the case being of stiff card, while the sides are of thick black paper, folded like the sides of an ordinary bellows camera. Against one of the stiff ends the dry plate is fixed, while in the centre of the other end is set a piece of very thin metal foil, perforated with a minute hole. This hole is, however, covered by a little flap, which is gummed down at the edges.

As the apparatus is sent out by "The Ready Fotografer Co.," of Beekman Street, New York, it is folded down to a total thickness of less than a quarter of an inch ; but when stretched out the camera is about four inches long.

Why do not English photographers turn their attention to instantaneous work in the way of studies for artists ? What the latter requires is a bit of absolute nature—sea, cloud effects, or animals—which he cannot, however rapidly he may work, secure. Just now a Posen photographer is carrying all before him, and his photographs, which are bought solely by artists, command high prices. Horses, pigs, monkeys, birds of different varieties, form the staple subjects, and very excellent indeed is the work. Still, when these photographs, about the size of cabinets, sell unmounted for half-a-crown, one would think it would be worth the while of some English photographer to enter into competition.

"You have a few things to learn in your country," said an American to us. "I had to draw some money at a banker's the other day, and, owing to a blunder somewhere, they wouldn't pay it ; said I wasn't the man for whom the remittance was intended. I got it, of course, after a time, but it was a great trouble. Now, in America, this kind of thing is impossible. When a man is going, say, from San Francisco to Chicago, and doesn't want to carry his money on him, he sends it through a bank, at the same time handing over his photograph to the banker at San Francisco for them to forward to their agents in Chicago. When the man presents himself at Chicago, they get out the photograph, see that it corresponds with the applicant, and, if it's all right, pay the money." The plan is not a bad one ; but, in view of the changes which some faces undergo in a short time, it would be necessary to have one's photograph taken at least once a year ; but photographers would not object to this.

Twelve tubes of chloride of gold, with fifteen grains of the compound in each, contain metal to the value of about twenty shillings, and yet one finds that there are people who offer to supply 15-grain tubes of chloride of gold at something considerably under twenty shillings per dozen. Is it that they make a loss on the transaction, as the grocers are said to do on sugar, this loss being made up by profit on other goods ?

How photography has affected wood-engraving in America we learn from G. W. Sheldon, who, in the course of an article on the subject in an American contemporary, says that of the fifteen or twenty first-class wood-engravers in the United States, it may be said that they have as much as they can do, and are paid for it as much as ever. But scores of good engravers who do not belong to the first rank have been driven to the wall, the work that they once did being done by process men at lower rates. Some of them are earning a modest living in the service of the process men. This is pretty much what is going on in London. A few of the leading men, like Swain, have had the good sense to accommodate themselves to the times, and have gone in for photography and transfer in addition to wood ; but the majority of engravers must, we fear, succumb.

The Convict Officer at Scotland Yard can now boast of a collection of nearly 34,000 photographs, dating back to 1862. They are placed in albums containing 6,000 portraits each, and duplicates are pasted in smallar volumes of 500, which also contain the particulars of each case. These albums are constantly being consulted by detectives, and, no doubt, frequently lead to the detection of criminals. Identification by measurement, to which we alluded some few weeks ago, does not appear to have been adopted by our police. As photography was shown to be at fault in the case of Dr. Vivian, the person charged with robbing hotels, it may be so in other instances, and perhaps the authorities may some day see the wisdom of supplementing identification by means of photography with measurement.

A well-known artist tells a story of the way he secured a portrait of the late Captain Gosset, Sergeant-at-Arms of the House of Commons. It was in the time of the Beaconsfield Cabinet, when the features of the Captain were entirely unknown. The portrait was wanted in a hurry for a political cartoon, and the difficulty was how to get it. First of all the artist went to Captain Gosset's home ; but there was a very important debate on, and the Sergeant-at-Arms had to be on duty. "Look here," whispered the artist to the footman, "I'll give you half a sovereign if you'll let me have a sight of the Captain's photograph." "Ah, sure sorr," said the servant—he was an Irishman—"I'd be only too glad, but the album's in the drawing-room, and how am I to get it whin the misthress is there all the toime ?" Foiled, the artist rushed away to the Houses of Parliament, and, with the courage of despair, boldly informed the policeman on duty that he wanted to see Captain Gosset. His card was accordingly sent in and the artist admitted into the lobby, there to await the coming of the great man. Presently he saw him advancing, looking about for the visitor. The latter began to feel rather embarrassed, for he was doubtful whether the Sergeant-at-Arms might not order him into custody for disturbing him on one of the most important nights of the session. As the Captain approached, a happy inspiration seized the artist. Captain Gosset did not know him ; why should he not remain quiet and say nothing ? So he did. The dignified official passed him, glanced right and left at the various persons waiting to see members, could detect no one who seemed to want to speak to him, made a gesture of annoyance at having been "sold," and retired. The artist was perfectly satisfied ; he had got all he wanted, and he retired also.

An instance of photography giving false testimony is furnished by a correspondent, who is a photographer in business in the suburbs. He says that some years ago he was called in by a publican, who had only a beer license, to photograph not only his own house, but the house of a neighbouring licensed victualler as well. The commission seemed rather a curious one, but it was not the business of the photographer to reason why, and he proceeded to do his best. It so happened that the publican's house—a new building—was situated at the corner of two thoroughfares, and formed an acute angle. The licensed victualler's house—an old one—was a long, low edifice, with plenty of frontage, but no depth. The only lens which the photographer had for the purpose was a Dallmeyer wide angle, and the consequence was, in the endeavour to make the publican's house look as large as possible, he planted the camera very near, with the result that the acute angled house came out with a violently distorted perspective. The licensed house, on the contrary, did not suffer in the least, as its lines were all on the same plane. The effect of the two photographs was rather disastrous. The publican, it seemed, had been trying for a long time to get a spirit license, but without success. It then occurred to him that he would show the magistrates a photograph of his own noble-looking structure, and also a photograph of the shabby house of his rival. Unfortunately, he did not open his mind to the photographer, who, by using an unsuitable lens, made the inferior house look very much more imposing of the two. Whether the photographs influenced the magistrates' minds, and caused them to refuse the license, it is impossible to say; but it is certain that the photographic evidence was not fair to the applicant.

Photography has changed a good many things. No longer is it easy to use the portrait of one person for that of another. The last generation must have been a very contented one when we are told by the author of the recently published "History of the Catnach Press" that the block from which the so-called likeness of the murderer Thurtell was taken served as the counterfeit presentment of all popular murderers for upwards of forty years. Still, queer things in the way of portraits are occasionally done even now. We know of an instance where, in a now defunct illustrated society paper of a sensational class, the portrait of a young American lady who had distinguished herself by shooting her lover, figured as the likeness of Madame Christine Nilssen. We are bound to admit that there was a certain resemblance, and as the readers of the papers did not know, very little harm was done.

The amateur photographer who goes in for pictures of Thames scenery at Richmond, Hampton Court, and other places on the river where the Cockney excursionists do mostly congregate, has need of much self-possession. To be asked, as though you were a fisherman, "Well, Guv'nor, had any sport to-day?" is not calculated to put you in a good frame of mind; nor it nice to be the subject of a controversy something after this fashion: "What's he a-taking of, Bill?" "Dunno; them trees, it looks like." "Garn; why it's that there cow on the bank." "Tain't, Maria; see where that brass thing's a-pointing? Aint a bit near the cow. More like that barge a-coming up." "Can't see no use in taking a likeness of a barge." And then they crowd round your camera when your back's turned, and invariably expect to see the picture on the lens.

It is not by any means certain that Justice North, in a case tried last year, took the right view as to the value of the evidence of a photograph. An action was brought by a manufacturer of memorial brasses to restrain his late partner from using the partnership name under which the plaintiff and defendant had been known. The defendant, it appeared, had used the partnership name on the facia of his shop, but prefixed by "late of," and to this the plaintiff objected as a contravention of the agreement for dissolution. Justice North, in giving his decision for the defendant, said:—"He had seen some very clear photographs which convinced him that the inscription was put in such a way that passers-by would not be deceived. The words 'late of' connecting the names were no doubt in smaller characters than the names themselves, but they were quite distinct, and could be read at such distance that there could be no mistake." Of course this may be so, but whether it was proved by the photograph is another matter. A photograph may be very small, and yet be perfectly distinct. In the case of a person with short sight it can be brought as near to the eye as is necessary, which could scarcely be the case with the letters over a shop-front. Indeed, it is quite possible to see in a photograph what can be seen only with difficulty in the object photographed. It may be that Justice North judged from the relative size of the letters, but even then there would be some doubt, because the relative height of the shop front would have to be taken into consideration. The defendant is to be congratulated on the assistance which photograhpy has rendered him ; but on the whole it would have been better had the judge seen for himself the inscription in dispute.

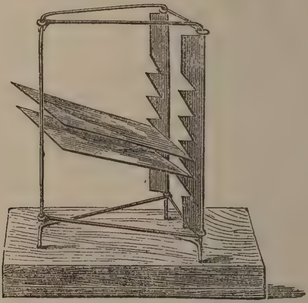
In addition to the above, it may be mentioned that it is possible to photograph letters, and to obtain very bright, bold photographs of those which are scarcely, if at all, visible to the human eye. Just in the same way one may select colours which contrast much in the original, but show no difference whatever in the photograph. One might paint on the same sideboard two inscriptions, one visible to the eye but invisible to the camera, and the other visible to the camera but invisible to the eye. When a photograph lies, it tells the worst kind of lie.

Pictures of such functions as the opening of Holloway College for illustrated papers are frequently composite productions, photographer and artist working together. The photographer goes down the day before and photographs (say) the building ; the artist is thus furnished with the architectural features, and has only to put in the crowd, which he can do without going near the place, as one crowd is very like another. To save time, the artist often takes the negative, and makes a tracing by the very primitive method of holding the glass up to a window pane, and drawing the outline on a sheet of paper placed on the negative. A writer in the *Printer and Lithographer* makes a very practical, but not original, suggestion which, if adopted, would save the artist a world of trouble. The plan is simply to make a light print on plain salted paper, and fix in the ordinary way. Toning, of course, is unnecessary, nor is much washing needed, as the presence of hypo is of no consequence. The artist goes over as much of the details as he wants, and the print is placed in a bleaching solution—bichloride of mercury will answer—which of course leaves the paper quite white, save where the pencil marks are. This print could be prepared very expeditiously, and no time—a matter of importance on these occasions—need be lost.

"The only sitter I ever had who was thoroughly satisfied with her proofs," said a well-known photographer the other day, "was a somewhat portly lady of about fifty. She wore a green satin dress, very *decolleté*, and with short sleeves, showing enormously fat arms. She was excessively bejewelled, and had on a fearful and wonderful head-dress. She looked so extremely satisfied with herself, that there wasn't the least occasion to ask her to look pleasant. She was photographed from twelve different points of view, and was so pleased with them all, that she ordered one print from each negative. My impression is that she never gave one away, but kept the whole twelve in an album for her own especial delectation."

If wood-engravers fear the rivalry of photography, which they have certainly good reason for doing, this rivalry has been brought about partly by their own acts. Eleven out of twelve artists who draw on wood complain bitterly of the way in which they are translated by the engraver, and we know of one well-known artist on the periodical press who much prefers to draw on card for photography, to avoid the risk of having his work spoilt by the ruthless engraver. In a biographical note on Sir John Gilbert, the *Athenæum* says: "One of his first difficulties as a designer was overcome when the woodcutters were taught to refrain from 'editing' away all the characteristic vitality and energy in which his works abounded. The usual process of cutting drawings on wood is fatal to everything but the smoothness of a mechanical translation from vigorous originals to vapid and polished versions." This is very true. Photography has revolutionised periodical illustrations in the same way that it has revolutionised portrait painting.

Ashman's rack for plates is represented by the accompanying sketch. It is made of wire and sheet metal, and, when not in use, can be folded so as to lie flat. By its use a number of plates can be readily liftsd from the wash water and put into a fresh supply.



A new terror awaits athletes and others who display their diversified ability in public, be it on the cricket-ground, the running path, the football field, or wherenot. For we read in one of the organs of lawn tennis, that at a tournament recently held at Bath, a local photographer "followed the best players about like their shadows," and succeeded in catching these players "in the most extraodinary positions." This is photographic enterprise indeed. The "chiel" that from Burns' time downwards has been "amang us takin' notes" is not to be compared for assiduity and determination to the new "chiel" who would now seem to be amongst us "takin'" photographs. It is only the lawn tennis player's turn to-day, but the turns of the cricketer, the runner, the billiard player will most certainly come.

The prison authorities in France are not contented with simply photographing criminals. To make identification absolutely certain, they now adopt in addition an anthropometic system. What measurements are considered as of vital importance in regard to comparison we are not told; but it is said the method is being found satisfactory, and probably the Amsterdam plan is adopted. This comprehends accurate measurements of the middle finger, the foot, and the head. It appears that the middle finger varies in males from 17 to 20 centimetres, the head from 16 to 21 centimetres, and with the foot the variations are still greater.

It is interesting to notice the ever-increasing way in which photography is becoming mixed up with well-nigh every social "function"—to use the word now in vogue with society journalists—and event of local or national interest. Take up a newspaper, London or provincial, and one's eye is sure to be caught by some such sentences as these: "The county eleven then partook of a cold collation at the invitation of the Earl of Timbershire; and, having been subsequently photographed in the pavilion, resumed their places in the field." "At the wish of the happy bride, the guests then inspected the wedding presents (which had been photographed with much success by our respected townsman, Mr. E. Mulsion, jun., of the Market Place), and then proceeded to the Terrace, where a camera was brought to bear with much success on the wedding party." "The men were then drawn up in line, and, photographic reminiscences of the interesting ceremony having been secured, his royal highness proceeded, amidst cheers, to address them." "A break in the proceedings was then utilised by the photographer in attendance, who, having focussed his camera, was successful in obtaining several excellent negatives of the distinguished guests assembled round the stone." "An adjournment was then made to the park, where the excursionists, having been taken in several groups by Mr. A. Lens (himself a Knight Harbinger of the Mangel Wurzelton Habitation), gave three cheers for the marquis, and made at once for the tea-tents." "Whilst waiting for the Grand Old Man to appear, a Chester artist secured a successful 'cabinet' of the deputation, and their illuminated address, copies of which have since been sent to Hawarden Castle." "Having been photographed in their Swiss peasant dresses, the ladies took up their positions at their chalet-like stalls, and the bazaar operations at once commenced." "The camera that dominated the fairy-like scene was then put in requisition, and without further delay the flower-show was declared open." But we need scarcely multiply instances which any reader of the newspapers can so easily recall for himself. The facility with which photographs can now be taken has doubtless had much to do with the satisfactory state of affairs we refer to. In fact, as an irrepressible correspondent lately put it to us, the general use of dry "plates" has made photography more than ever a matter of "course." In other words, a photographic item is now to be found in nearly every "bill, of fare."

The head of Theobald's folding stand consists of three similar metal pieces, B, C, and D, these being hinged together by the pins, E and F. To put the top of the tripod in condition for use, the metal pieces are turned on the hinge pins E and F, so as to make the two holes marked A to coincide, as shown in fig. 2. The camera screw is now passed through the two holes, A, (fig. 2).

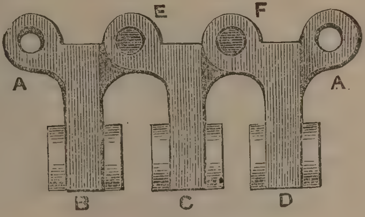


Fig. 1.

Now as to the legs. They are hinged on to web-like extensions of the metal pieces, B, C, and D, and the curved tops of the legs are shown at the lower part of fig. 1, as they appear when the stand is folded for use ; only, as a matter of fact, the legs are divided, one half sliding against the other, the lower portions so closing up as to occupy the space from A to A. It will thus be seen that even when the head is attached to the legs, the stand will fold up to a compact and easily portable mass, and without separating parts. Such a stand as this can be put up into a position ready for use in a remarkably short time. The stand sent is very roughly made, and is intended for sale at a low price ; but possibly a more expensive form may be put on the market.

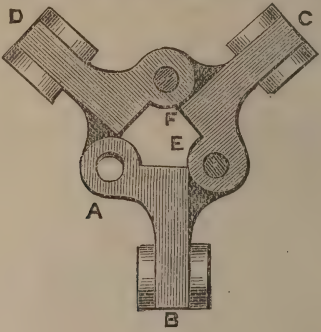
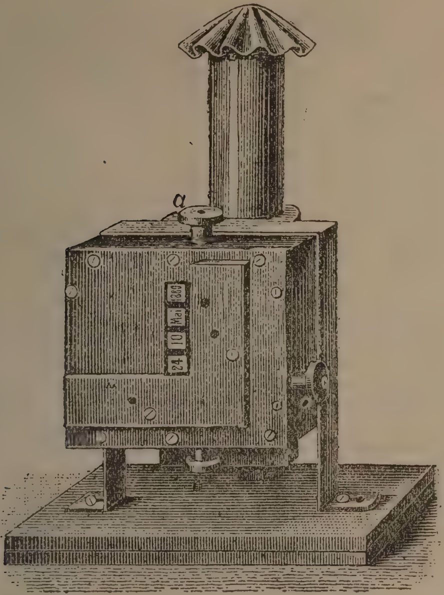


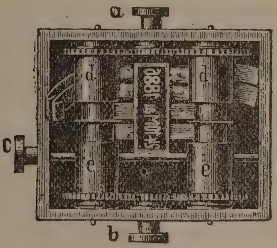
Fig. 2.

That ingenious amateur photographer who, when at the seaside, used to photograph the cold legs of mutton and other joints before they left his dinner table for the lodging-house keeper's kitchen, has been again turning his camera to useful account. Before leaving his country house for a protracted bicycle tour, he ostentatiously took photographs of all his wall-fruit trees and the grape vine in the presence of his children. "It would be so interesting," he told them, "to compare walls when he returned."

When any photographic specimens of unusual merit are exhibited, the common question is, "What process has been used ?" and the questioner, as a rule, expects to find that the operator has employed some special "dodge." In nine cases out of ten the answer is, "Oh, only the ordinary method—no special means" ; and the querist is naturally disappointed. The question of degree in skill is always an unpalateable one to accept. A case in point occurred at a recent meeting of the Royal Microscopical Society, H. Evans exhibiting some photo-micrographs printed by the Woodburytype process, and transferred to lantern slides. These photo-micrographs were of singular beauty and excellence, the principal feature being, that though the objects were opaque, and the surface irregular, yet all the inequalities were in focus. The President was the first who put the stereotyped query, to which Mr. Smith (of the Sciopticon Co.), who had prepared the prints, replied that there was nothing special in the mode of production, adding that the Woodburytype process was undoubtedly the best for the work. But this did not satisfy another member, who repeated the President's question, and received from Mr. Smith the answer that "it was simply a matter of manipulative skill." A very simple explanation ; but how much does not "manipulative skill" imply ?

E. Krause's ingenious arrangement for numbering negatives is a lantern provided with tranaparent bands, upon which are impressed figures and numbers which serve for date and number—in fact, much such an arrangement as





the automatic numbering stamp used by printers ; but instead of type we have transparencies with a light behind.

The above blocks almost explain the arrangement. Each plate is, before development, rested in the angle piece as shown, and exposure is made by means of the knob at the right of the figure—the smaller block shows the numbering apparatus detached, and it may be fitted into a window if preferred.

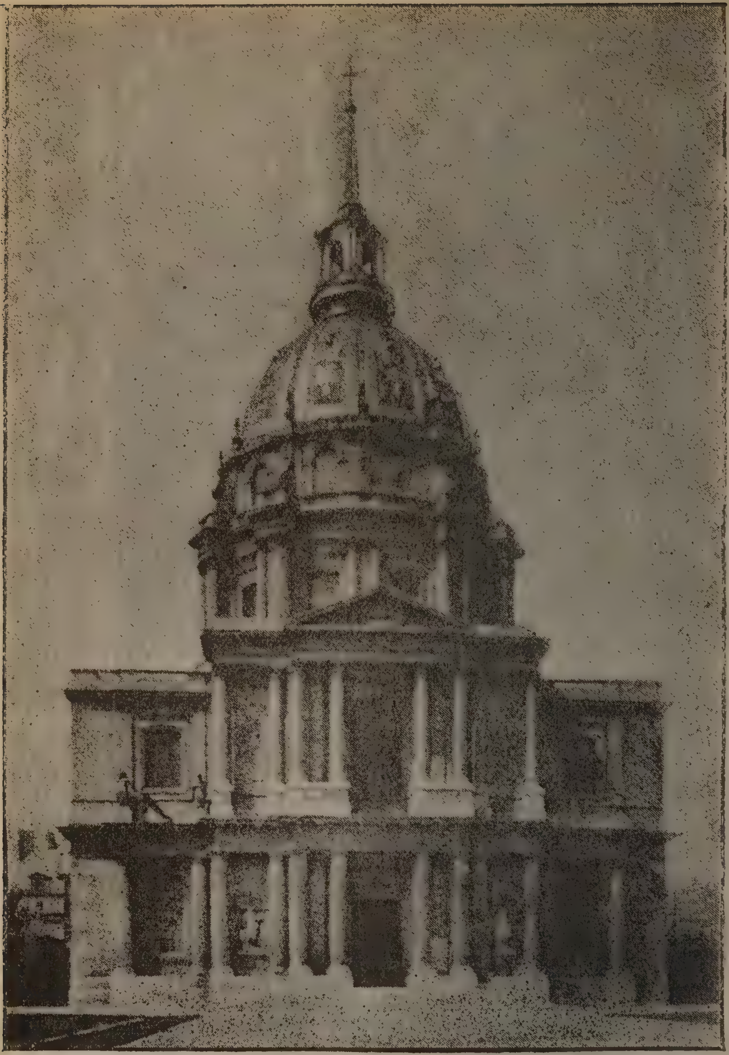
"Photographing in the London parks is a thing to do," writes a correspondent; "and it is surprising how much opportunity there is of obtaining really pictorial results." He continues: "There is no difficulty in getting permission; a letter of request to H. R. Potter, H.M. Office of Works, will bring a ticket in twenty-four hours, granting a permit for six months from date, but it is not available on Sundays."

Most photographers feel a little shiver of dread go over them when it is intimated from the reception-room that a baby is coming to be photographed. They will therefore feel curious to know how certain American photographers find it pay to advertise for handsome children as models. This is how it is done. First a taking advertisement is inserted, and catching the sight of innumerable mammas, they forthwith, one and all—for where is the mother who does not believe her baby to be the handsomest in creation?—proceed to the advertiser, having in their own minds settled what sum they will demand from the photographer for the privilege of taking the portraits of their darlings. The mother once inside the studio, the process of extracting money from her, instead of paying it to her, commences.

And a very easy process it is. The photographer is excessively sorry, but the model market is fully supplied. Had the lady only come the day before, he should have been but too pleased, for a more lovely child he never, &c., &c. Or it may be that it is a question between another baby and this baby, but there can be little donbt that such a charming baby as this, &c., &c. Or perhaps the photographer wanted only boy babies, and this happens to be a girl baby, or *vice versa*. Had he or she been otherwise, the photographer would have been too delighted, for a more exquisite child he never, &c., &c. The upshot of it is, the mamma is easily tslked into paying for half-a-dozen or a dozen copies, and perhaps goes away proud that her offspring was so near being selected as a model. This method of doing business may not have any foundation in fact, but the *New York Sun* says it is so, and we presume it knows.

"Is it a bad thing to smoke in the dark room when developing gelatino-bromide plates?" asked a member just as the Technical Meeting of the Photographic Society drew to a close. A member of the Anti-tobacco Association, who happened to be present as a visitor, got up immediately, and said emphatically, "It is bad"; but he meant bad for the photographer, and it had to be explained to him that the real question was as to any injurious action on the plate. After a few remarks, the question was unanimously referred to A. Cowan, but this gentleman hesitated to express an opinion. He said that he certainly could recollect a few occasions when he had been in the dark room without his pipe, but he had failed to notice that the negatives were any better when he was not smoking. The meeting, with one dissentient, considered this satisfactory, and opined that smoking in the dark room is allowable.

Photography is a good test of popularity. It is said that one firm alone of photographers could have sold 10,000 copies of the late Fred Archer's portrait during the week that he died, could they have been obtained.

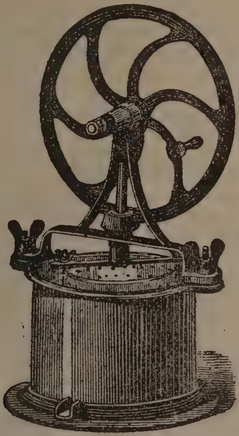


A photograph taken by M. Colson with pinhole stop in place of lens. Diameter of hole $\frac{1}{50}$th of an inch, distance of plate from hole 5 inches, exposure 20 seconds.

Everyday Experiences and Processes.

GEBHARDT'S CENTRIFUGAL APPARATUS FOR LABORATORIES.

The apparatus here illustrated has been put on the market by C. Gebhardt, of Bonn. It weighs about 30 pounds, and is 11½ inches in diameter, and nearly 24 inches in height. Every portion which is liable to come into contact with the liquid to be separated is enamelled.



PAYNE JENNINGS ON MOUNTING PHOTOGRAPHS.

The rough untrimmed prints are first cured of their tendency to curl inwards by being placed face downwards on a pad of felt or other soft material; the thin edge of a paper-knife is then passed over the back of each print, pressing from the centre outwards; this will give the prints a fixed set, and they will, when placed together, remain perfectly flat without further trouble, and the prints are now in a nice condition for being carefully trimmed.

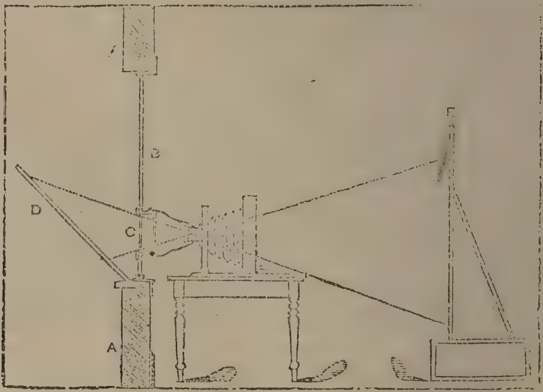
I am aware that this preliminary process of straightening the prints will to many readers seem unnecessary, but I can assure them that when once they have tried the method, they will ever after adopt it. It is done in a few minutes, and one is well repaid by the comfort and ease experienced in the subsequent operation. We will now suppose your prints and paper are dry and flat ready to hand, also a solution of freshly-made dextrine. Now take (say) a dozen of the sheets of paper, and with a moistened sponge damp the back of each sheet; then take up the first of the photographs, and having pasted the back with dextrine, place on it the first of the damped sheets of paper.

Now rub down smoothly, and take the next one, and so on until you have the twelve mounted. Then take these twelve, and place separately between the two stout sheets of millboard, such as used by book-binders. Now mount twelve others in a similar manner, repeating the operation until all are mounted and placed separately between successive layers of millboard. They are now to be left to dry, and when taken out will be found to be perfectly flat, and will remain so. As a final operation, and in order to give increased brilliancy and smoothness to the surface, they should now be hot-pressed, and are then ready for the binders. Of course every expert mounter knows that different qualities of paper require more or less damping previous to receiving the print. The whole secret of success, in fact, lies in the study of comparative expansion and contraction. A test trial is usually made with a fresh quantity of paper, after which the mounting of thousands may be proceeded with in perfect safety.

A word now as to the mounting of albumenised prints upon glass so as to retain all the beauty and delicacy of a print fresh from the washing trough. First, you must be careful to print somewhat deeper than usual, in order to be sure you have all the detail out of the negative ; also be careful not to overtone your prints. Now make a solution of gelatine one part to fifteen, and, having your prints ready, place them in a dish containing a weak solution of gelatine —say one to forty. Now take a plate of glass slightly larger than your print, warm it over a stove, and pour from a jug or other vessel sufficient of the thicker gelatine to cover the glass, spreading it over with a glass rod ; then take a print from the dish, and with a rubber squeegee press the prints into optical contact with the glass, sponge off the surplus gelatine, and the operation is complete.

HOW TO ENLARGE.

Enlarging on the various sorts of development paper now in the market is a very simple affair, whether one prefer to work by daylight, or by artificial light. The essentials of the apparatus are the following :—Some means of uniformly illuminating the negative, and an objective placed so as to project an image of the negative upon a flat screen, to which the sensitive paper can be pinned.



In the foregoing diagram we give an example of the usual scheme for working by daylight.

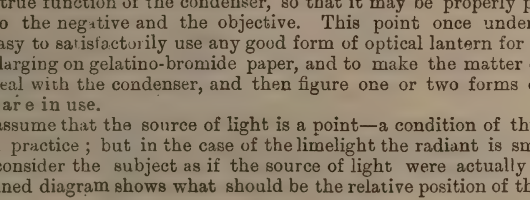
A and A represent the external wall of a room, and B is an opaque shutter which occupies the place of the window; in this shutter is an aperture at C, the negative being fixed in this aperture, generally with the aid of a conveniently fitted holding frame. D is a reflector, and may either be an ordinary looking glass, or a flat of wood covered over with white paper.

Inside the room is supported a camera, from which the dark slide and the focussing glass have been removed, and this is placed at such a distance that a sharp image is projected upon the paper-covered screen E. In order to prevent the entry of diffused light into the room, a cone-shaped bag of black cloth serves to connect the lens mount of the camera and a light wooden frame, which surrounds the portion of the shutter in which the negative is supported; this bag being shown near C, and having a running tape at each end.

A word or two as to lenses and adjustments will now serve to make all clear regarding the working of the arrangement. Generally speaking, the lens which was used in taking the original negative will serve very well for making the enlargement; but, subject to the generally recognized merits and defects of each form of lens, any objective may be used. When, however, it is a question of obtaining a lens specially for this work, it is, perhaps, best to obtain a rapid form of the rectilinear or symmetrical, so that the focussing can be performed with a large aperture, and a stop then introduced to give the requisite sharpness and depth of focus. The farther the screen E is removed from the camera, the larger will the projected image be; but each increase of distance between screen and camera involves bringing the lens nearer to the negative, and as it is merely a case of adjusting these two distances, any required scale of enlargement can be rapidly arrived at. Exposure is simply a matter of experiment, and for a first trial as to the time, it is a good plan to cut a few strips of the sensitive paper and to pin them to the screen E, one of them being removed from time to time and developed. A convenient arrangement to cutting off the light is an opaque cloth hung over the open end of the camera.

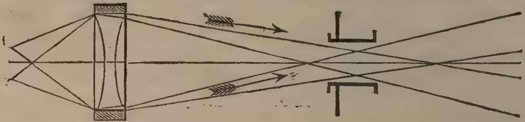
When artificial light is used a condenser is required, and the form of apparatus which can be used may vary very much, but the main point is to understand the true function of the condenser, so that it may be properly placed in relation to the negative and the objective. This point once understood, it becomes easy to satisfactorily use any good form of optical lantern for the purpose of enlarging on gelatino-bromide paper, and to make the matter clear, we will first deal with the condenser, and then figure one or two forms of appatus which are in use.

Let us assume that the source of light is a point—a condition of things impossible in practice; but in the case of the limelight the radiant is small, and one may consider the subject as if the source of light were actually a point. The subjoined diagram shows what should be the relative position of the source



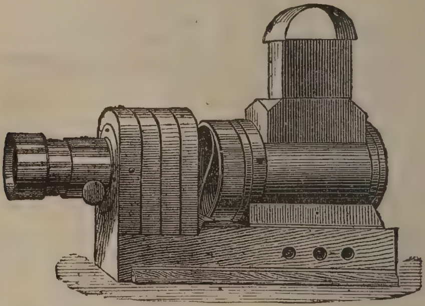
of light, the condenser, and the objective; the essential for good illumination being that the image of the source of light, as formed by the condenser, should be produced exactly at the optical centre of the objective. If this matter is attended to, not only is there a minimum loss of light, but one realises all the sharpness which would result from working with a small diaphragm; in fact, a diaphragm may be introduced into the lens without in any way altering the conditions. The most perfect lantern, whether for enlarging, or for projection, is one in which light, condenser, and objective are immovably fixed according to the positions indicated by the diagram, and the focussing is effected by shifting the position of the slide in the cone of rays. Such a lantern was, we believe, manufactured by George Smith, but the public preferred the ordinary model. If it is required to shift the objective P inwards towards the condenser, the balance of the system is overturned, and can only be restored by removing the light further from the condenser; while a movement of the objective outwards would make it necessary to place the light nearer in towards the condensing lens. If one had only occasion to use one objective on the lantern, it would be possible to so gear the lime-light holder and the objective together that both movements could be made simultaneously; but there is often occasion to change the objective for one of another focus.

The following diagram will illustrate the condition of things when the radiant

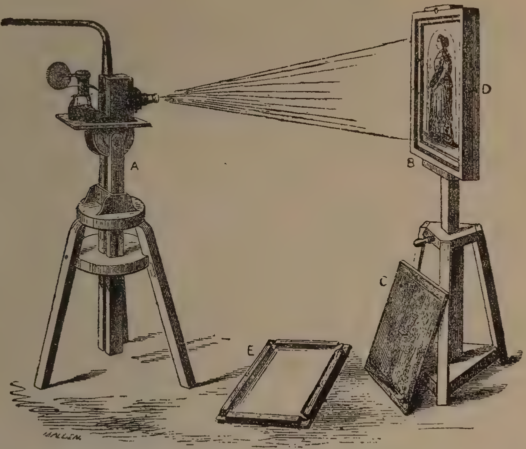


is large, as is the case of a lamp flame; and it will be seen how some rays from the radiant may be brought to a focus outside the tube of the objective, and others at the extreme edges and inside the tube; a condition of things which not only occasions a loss of light, but also unsharpness at the edges of the field

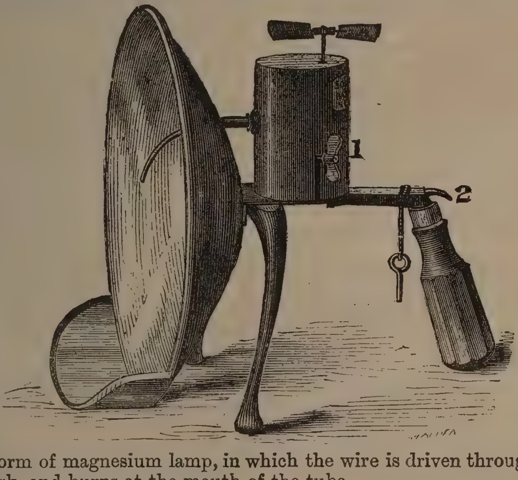
The subjoined cut represents the "Sciopticon" type of lantern, generally constructed to burn mineral oil, and it may be looked upon as the cheapest form of apparatus which can be used to advantage.



We now give a cut of the enlarging arrangement introduced about twenty years ago by J. Solomon, and which has served as a general pattern since. This arrangement sufficiently explains itself, and it may be mentioned that although it was constructed for use with the magnesium lamp, this form is equally well-suited for other artificial lights. The magnesium light, however, is one very well



adapted for enlargement work, and as the price of magnesium wire has recently fallen from 12s. 6d. per ounce to 2s. 6d. per ounce, we also give a sketch of



Solomon's form of magnesium lamp, in which the wire is driven through a tube by clockwork, and burns at the mouth of the tube.

ASHMAN ON COLOURING PHOTOGRAPHS AGAINST GLASS.

The Crystoleum Process.

Trim a deeply printed silver print a little smaller than the size of the glass to be used ; rub the albumen side gently with a piece of linen rag dipped in benzoline as supplied at the oilman's, plunge it into warm water, and after two changes blot it on a clean towel ; place the albumen side upwards on a hard flat surface (a piece of plate-glass), and apply the mounting solution or paste all over it.

Mounting solution is composed of :—

French gelatine	20 grains
Water	1 ounce

to which is added an alcoholic solution of salicylic acid five drops ; this requires warming up a little before using.

Mounting Paste.—French gelatine twenty grains, dissolved in water one ounce ; to this add an equal volume of ordinary starch paste, and a similar quantity of Kingsford's oswego blancmange, and twenty drops of an alcoholic solution of salicylic acid as an antiseptic ; heat the above ingredients over a water-bath for a few minutes, stirring the whole time ; when cold it is ready for use. To a previously cleaned convex glass apply some of the same mountant as used on the print all over the inside surface, then lower the print, albumenised side down, gradually on to the inside of convex glass. It does not require any great amount of skill to do this without blisters or creases ; but, if such should occur, it may be easily withdrawn and mounted afresh. Well squeegeeing, to remove excess of paste, is the next operation, after which it may be placed on end to dry spontaneously, which will take from six to twelve hours according to the temperature. To make a squeegee, procure a strip of rubber composition about one-eighth of an inch in thickness, cut one edge to fit the bevel of large plates, place a strip of wood on either side, and screw all together, leaving about one inch out on the bevelled side. No squeegee will be found necessary when small plates are used, any excess being more easily removed by the fingers.

When the photograph is quite dry, place it on a cushion, and rub the paper away with fine glass-paper, working gently in a circular direction, the object being to get the photograph as thin as possible, and thereby more easily permeated in the next operation ; but care must be taken not to grind off all the paper.

There are several substances suitable for rendering the prints transparent, but I have found as good as any a mixture of

Canada balsam	5 ounces
Solid paraffin	2 ,,
White wax	2 ,,

Melt at as low a temperature as possible, then place the picture therein, keeping the composition in a molten condition either in a slow oven or on a water bath. If a high temperature be maintained, the print will lose its whiteness, and, when painted, will appear somewhat bilious. At the end of an hour the picture should be examined, when, if it is quite transparent, it may be removed, and when cool enough the excess wiped off. If, on the contrary, opaque patches are still visible, it should be allowed to get cold, then rubbed down a little more with glass paper, and again put into the wax composition, allowing it to remain until the marks disappear. When cold, rub off all excess, and proceed with the painting.

A few days ago I was shown some pictures treated as above, but the painting was performed with a shilling box of water colours, and though so little had been done, it was really surprising what a pretty effect it had. To overcome the difficulty of putting water colour on such a repellant surface, my friend said he had used shellac dissolved in borax as a medium to mix the colours ; he then found no difficulty in working in any way he pleased on the print, whilst for the back glass, water answers equally as well as on colours ; but this class of picture seems to lend itself particularly to oil colours.

Having prepared the photograph, the next thing will be to describe, as concisely as possible, the operation of colouring. The glass supporting the photograph should be laid on the retouching desk, concave side upwards, and the most important points noted. These comprise such things as the eyes, lips, high-lights, hair, flowers, jewellery, and small details, &c., for they must be all coloured on the back of the photograph. I would recommend the beginner to paint in the hair, flowers, and jewellery before attempting the eyes, for they will be found more difficult than any other part of the process. Mix a little each of Naples yellow, Indian yellow, and poppy oil for very light golden hair ; burnt sienna and poppy oil for brown hair ; and black, Vandyke-brown, and poppy oil for very dark hair. Linseed and boiled oil may be used for the purpose instead of poppy oil ; but the latter will be found to answer every purpose.

Having applied the paint to the hair, turn the glass round to see the effect ; also whether the whole surface has been covered or not. Should it have been satisfactorily performed, the lips and cheeks may be done next. They should be painted with a mixture of vermilion and carmine in the following manner. Run a line of colour along the surface with a brush well charged with colour, softening it off with a dry brush. While working with this colour, put a spot in each nostril, to warm up the heavy shadows in the photograph ; also in the corner of the eyes, and any other part of the picture requiring that mixture. It will be well to again examine the picture from the front.

All being satisfactory, the eyes may be next attempted. Paint the pupil with pure black, and the light spot in the iris with Chinese white. Mix a little blue with the Chinese white for the white of the eye. When quite dry, paint the iris with a mixture of ultramarine and poppy oil for deep blue eyes ; mix black, white, and ultramarine for grey eyes ; and for dark brown eyes use Vandyke-brown with black, using poppy oil in each case. If the colours are not strong enough, they may be strengthened ; but the first must be allowed to get quite dry before the second application, otherwise a muddy effect will be produced.

Eyebrows, moustachios, aad whiskers are coloured by laying on the colour sparingly, and softening off with a dry brush. There should be just enough colour laid on to do this nicely, because too much will look harsh, and not enough tends to flatten the picture.

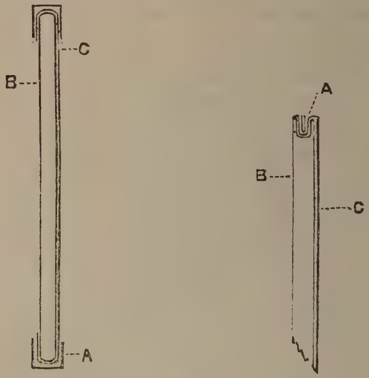
Paint the jewellery in solid colour, using, for gold, Indian yellow, Naples yellow, and vermilion ; for silver, use Chinese white and black.

Lace should be touched up, the lights with Chinese white laid on thickly, and the shadows with grey composed of black and white. When the colours are dry, attach the second glass by means of gummed paper. Mix Chinese white with all the colours to render them opaque, and apply them roughly over the surface, no part of which should be left uncovered. The flesh colour is composed of Naples yellow, vermilion, carmine, and Chinese white, thickly laid over the flesh parts, deepening the cheeks, if necessary, with vermilion, the shadows with a slight admixture of ultramarine, according to the subject. Dresses will, in many cases, be left to the taste of the operator; and in painting them it must be borne in mind the sort of background that is intended, for harmony must prevail where large surfaces—such as backgrounds and dresses—are treated. Otherwise, however nicely the flesh and other details may have been executed, if the larger surfaces do not agree, the result must be considered a failure (loud, in fact). Any work put on, if found afterwards to be unsatisfactory, may be easily removed with rectified spirits of turpentine on a piece of linen rag, and the same substance will be found useful for cleaning the brushes, finishing them in a little methylated spirit.

The principal tubes of colour required will be Chinese white, black, Vandyke brown, chrome No. 1, burnt sienna, Naples yellow, ultramarine, Indian yellow, carmine, vermilion, also a bottle of poppy oil; brushes and palette, turpentine, and methylated spirit.

BARCLAY'S SUPPORT FOR NEGATIVE PAPER.

This device—due to F. K. Barclay—has the especial advantage of being simple and easy to construct. He says:—"I have just made a clip for holding paper in the dark-slide; it works well, and is easily made. Two strips of thin sheet brass are bent so as to fit over the ends of a piece of thin ebonite; these strips come over the paper about one-eighth of an inch. For foregoing, diagram will make all clear."



A, Brass Strip; B, Ebonite; C, Paper.

If the ebonite is slightly curved when the paper is put on, it will stretch the paper on righting itself, and the paper will be quite flat.

In looking at Barclay's clip, it struck us that in some cases it may be convenient to make it smaller, and to use it in a reversed sense; that is, in such a way that the paper is clipped in a groove ploughed out of the end of the ebonite, a strip of brass then serving to hold it. The second diagram will illustrate this.

COLLODION PROCESS.

Cleaning the Plate.—For polishing the glass plate use—

Iodine	1 drachm
Tripoli	3 ounces
Methylated spirit	1 pint

Collodionising.—Care is to be taken that the back and edges of the plates are freed from dirt and dust previous to coating, and that the collodion film is allowed to set well before placing in the bath.

The Silver Bath, when compounded of pure nitrate of silver and distilled water, as a rule, will work well at once, but sometimes a trace of nitric acid is required, so as to make the liquid slowly turn the colour of blue litmus to red.

Nitrate of silver	1 ounce
Distilled water	12 ounces

Nitric acid, about one drop (if required).

Developer.—One of the best and handiest methods of compounding the developing solution is to keep a standard solution of the sulphate of iron.

Sulphate of iron	10 ounces
Water	20 ,,
Sulphate of copper	1 ounce

To make a twenty-grain developer, take—

Of the above	2 ounces
Glacial acetic acid	6 drachms
Water	18 ounces

Alcohol is required to make the solution flow easily over the plate; about one ounce to each pint of developer.

More or less of the standard solution of iron is used as a stronger or weaker developer is required. In the case of under-exposure, a strong developer is very handy to bring out detail and promote harmony; for over-exposure the negative should be fixed, very thoroughly washed, and intensified afterwards.

In photographing a subject presenting violent contrasts, the use of a strong developer will tend to promote harmony in the negative, and on a subject where the general effect is flat, a weak solution will give a brighter picture.

Intensification is rarely necessary. But if, however, it is needed, subjoined is the formula:—

Pyrogallic acid	40 grains
Citric acid	60 ,,
Water	20 ounces

This solution will not keep long: it is to be used with a few drops of a thirty-grain solution of nitrate of silver added to each ounce.

Fixing may be accomplished in either cyanide of potassium, 20 grains to each ounce, or in hyposulphite of soda, 70 grains to each ounce; but if the latter be used, more copious washing is required than when cyanide is used.

Varnishing.—Take—

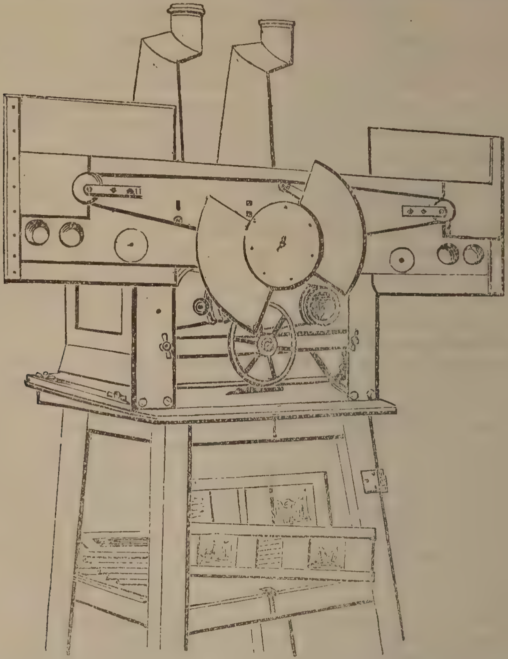
Gum sandarac	¾ pound
Gum shellac	2 ounces

Place in a bottle, cover with absolute alcohol, allow to digest for two days; pour off the liquid portion into a Winchester, add more absolute alcohol, and again digest for three or four days, stirring or shaking occasionally ; now add to that already in the Winchester, one ounce of castor oil, shake well, and dilute by filling up the Winchester with methylated spirit ; allow to stand, and settle. A Winchester is a glass bottle holding half-a-gallon.

See STANDARD FORMULÆ.

STROH'S LANTERN STEREOSCOPE.

Two optical lanterns are placed side by side, as for dissolving views. Two transparencies, photographed as if intended for an ordinary stereoscope, are placed one in each lantern, and projected on a screen in such a position that they overlap each other as nearly as possible. The picture which is intended to be seen by the right eye may be placed in the right-hand lantern, and the other in the left.



Supported by suitable framework, and in the front of the two lenses of the lanterns, is a revolving disc, portions of which are cut away, so that during its revolutions it obscures the light of each lantern alternately, or, in other words, so that only one picture at a time is thrown on the screen. A repeated change from one picture to the other is thus obtained.

In the same framework, and in convenient positions for the observers, two pairs of eyeholes are provided, one pair on either side of the apparatus. Behind each pair is also a rotating disc, and these discs are connected by suitable wheel-work or driving bands with the one previously mentioned, in such a way that the three discs rotate together, and at the same rate. The two last-named discs are also so cut that they will obstruct the view through the right and the left eye-holes alternately. Finally, the connection between the three discs has to be so arranged that the time of obscuring the view through the right eye-holes or the left eye-holes shall coincide with the time when the light is shut off from the right or left lens of the lanterns respectively.

It is obvious that by this arrangement an observer can only see the picture projected from the left lantern with the left eye, and the one from the right-hand lantern with the right eye.

The rotation of the discs must be of such a rate that the alternate flashes of the right and left pictures on the corresponding eyes follow in such rapid succession, that the impression made by one flash does not diminish sensibly before the next flash on the same eye is received. The number of flashes for each eye, which is required to produce an apparently continuous view, without any flickering effect, is from thirty to forty per second. As the discs are so cut as to produce two flashes for the right eyes and two for the left in one revolution, they must consequently be kept rotating at a rate of from fifteen to twenty revolutions per second.

The rotation of the discs is effected by a driving-wheel and band, worked by a crank handle at the back of the apparatus.

Considering that by this arrangement the two eyes never see at the same time, and that each eye views its picture after the other, it is interesting to find that the persistence of vision so completely bridges over the alternate interruptions to which it is subjected, as to produce the effect of a continuous view.

ADCOCK ON SITTING-ROOM PHOTOGRAPHY.

The things to observe, are :—

1. A good summer light, and a time of day when the sun does not enter the room.
2. Plant lens at window end.
3. If other windows are at sides of the room, subdue light from them by blue tissue, or linen blind, or muslin curtains.
4. For sitters, select those who can maintain pose five minutes. Give the easiest chairs and the most supporting positions to those most shaky.
5. Try the largest fixed stop. If models are staunch, of course take a longer exposure, and a smaller stop.
6. Focus on extreme end, and then give two turns of screw outwards. This, without destroying definition at far end, assists the near objects.
7. If you have gas, light up dark corners with it ; if not, stick lamps about. The help may be slight, but there will be help.
8. And important—be patient in developing.

Of portraits I have little to say. Let me plead for what is desirable—that you should do more of it. Land and seascape are good, but even in your landscape, let figure enter.

For single figures, I used a portrait combination. I placed the sitter for the light to fall on one side of face, and I used a clothes-horse and a table cloth to reflect light on the shadow side. If a wall in the room did not give me a background, I should hang up something for one. By this I mean, disregard everything else to get the best lighting. Now, in my opinion, all success lies in two words—reflector, reflectors. With them, you may get charming effects ; without them, you may expect soot and whitewash. Manipulation, however important, is only one part of portraiture.

A MEASURING POURER FOR EMULSION.

Herr Barth, of Deschney, describes an ingenious emulsion pourer for coating plates, or measuring fluids, which he believes will be of use both to professional and amateur photographers, and of which we append an illustration with description. It is constructed in the shape of a glass phial, with a graduated stopper (*c*), the position of which determines the quantity of emulsion which can be poured out.

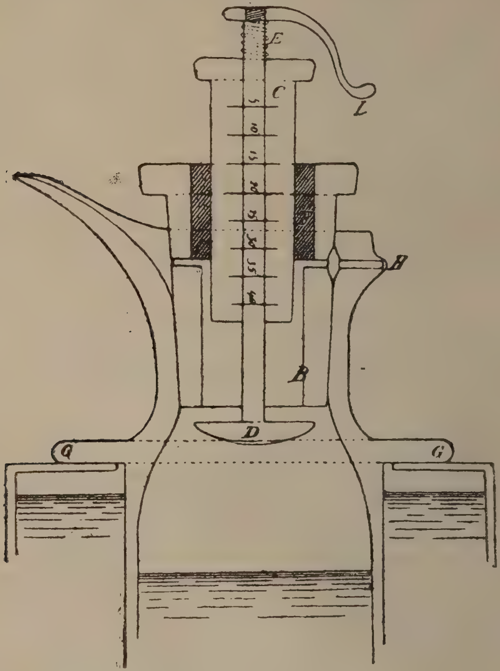


Fig. 1.

B is a hollow stopper.

C, a measuring tube, with the necessary divisions marked on the side of the stopper.

D, stop-valve, the stem passing through spiral spring.

E, the stem, which passes through cylinder C, and can be worked by a pressure of the index finger.

F, india-rubber ring, by which the holding in position of the measuring cylinder is rendered certain.

G, rim round the bottle, for supporting a tin vessel with hot water.

C C, holes which permit the free flow of emulsion or other liquid.

K, outflow.

L, lever screwed in D, so as to reach it with the index finger.

H, vent-hole, managed by the thumb.

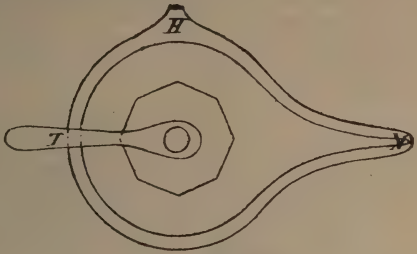


Fig. 2.

In figure 1 the valve-holes are represented opposite each other, but as this would be impracticable, the position in which they should be viewed is as illustrated in figure 2.

FREWING'S METHOD OF PHOTOGRAPHING ON WOOD.

Make up—

Gelatine	2 drachms
White curd soap	2 ,,
Water	16 ounces

Soak gelatine for some hours, then dissolve in a hot water bath. Add the soap in small shavings, stir with a glass rod until well mixed, and then add powdered alum until the froth disappears. Strain through muslin.

The wood-block is now coated with this mixture and a little zinc white, and rubbed well into the block with the thinnest possible coating, and finished off smoothly and evenly all over, and allowed to dry; after which, the following composition is applied to the face of the block with a camel-hair brush; the brush should be a wide one, as the marks of the join sometimes show in the finished picture if not carefully and quickly done; one coating with the brush from end to end of the block in one sweep is sufficient. Then dry.

Albumen	1 ounce
Water	6 drachms
Sal. ammoniac	18 grains
Citric acid	5 grains

Beat the albumen to a froth and allow to settle, using the clear part; add the water; then the sal. ammoniac, mixing well with a glass rod; finally the citric acid. When the block is again dry, it is ready for sensitizing

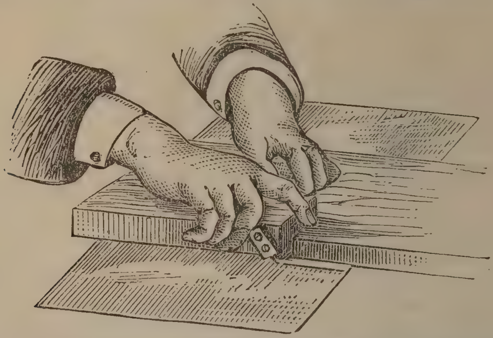
Sensitizing Solution.

Nitrate of silver	50 grains
Water distilled	1 ounce

A small quantity of this is poured on the block and coaxed over the block with a glass rod, the surplus put in another bottle for filtering for future use. When dry, the block is ready for printing under a reversed negative. It should only be printed just as you would like to see it, as it does not lose in finishing. When sufficiently printed, hold it, face down, in a dish of strong salt and water for about three minutes. The picture will slightly fade under this treatment. Now well wash under a spray of water, and fix in a saturated solution of hyposulphite of soda, holding the block face down on the solution for four or five minutes, which will bring back all the original detail. Now well wash under a spray of water for about ten minutes. Stand on end to dry. It is then ready for the engraver.

COWAN'S ARRANGEMENT FOR CUTTING GLASS PLATE.

Nine persons out of ten cannot use a diamond—in fact, they cannot keep the cutting angle. Cowan fixes the iron setting in which the glazier's diamond is set to a wooden block to which a side guide is attached, and he uses a correspondingly thick piece of wood as a straight edge. The accompanying sketch will make all clear to a person of very moderate intelligence.

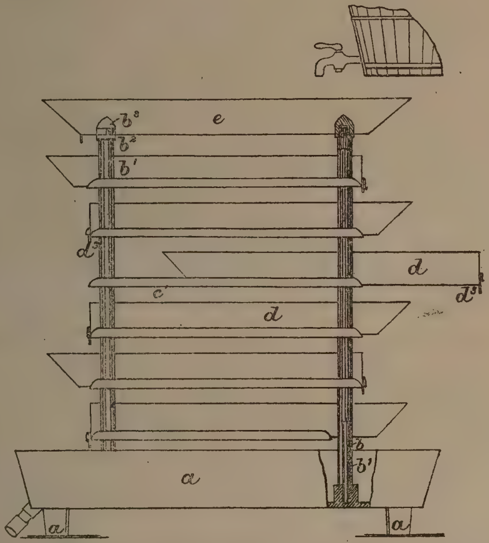


WATERHOUSE'S METHOD OF PHOTO-ENGRAVING.

An ordinary carbon print is developed on a polished plate of copper; this being thinly plated with silver, in order to prevent its adhesion to the electrotypic copper which is afterwards to be deposited on it. While the carbon print is still wet, fine sand is dusted on it; but this sand has previously been slightly waxed or stearined to prevent its permanent adhesion to the gelatinous matter which constitutes the body of the carbon print. When all is dry, the sand can be removed by a gentle friction, leaving the gelatine in a honey-combed or grained condition. Blacklead is next gently rubbed on the picture, and this substance readily adheres to the gelatine, where its presence is required to render the surface conducting; but it refuses to attach itself to the metal plate, where, indeed, it is not required. An electrotype cast is next taken from the metallic plate, which now bears the grained carbon print, and this cast constitutes the printing plate. All the operations are easy, fairly certain, and the process requires little plant beyond what is to be found in the work-place of almost any experimenting photographer.

WHITING'S ARRANGEMENT FOR WASHING NEGATIVES.

THIS consists of a supporting frame, comprising uprights and shelves fastened thereto, with a series of pans supported on the said shelves, each pan being provided at one end with a delivering-lip of a height greater than the thickness of the article to be washed, and projecting at the other end beyond the delivering end of the next pan above.



SNOW EFFECTS IN PORTRAITURE.

THE most important consideration is to secure a natural effect, and it will be readily understood that by paying due attention to the selection of dress and pose, more than half the battle has been won. Fur garments will at once be suggested as a valuable aid in choosing suitable costumes, and they have the further advantage of giving strength to the picture. Trees and tree-stumps form useful accessories, and an umbrella is by no means a bad piece of property; but it is better to hold it in a position that would cover the shoulders and back, rather than as an extinguisher of light to the head. Light backgrounds should be selected, since they materially aid in giving softness and harmony, while they also greatly assist in printing vignette when such a proceeding is deemed desirable.

Presuming a good negative of the chosen subject suitably posed has been made, it should be varnished, and the flesh portions retouched in the ordinary manner. We should then place it, film uppermost, on a good sheet of white paper, previously laid upon a flat table, in a good light, in order to watch clearly the work as it proceeded. Daylight is preferable. An opaque colour is then applied to the varnished surface in a manner best calculated to resemble flakes of falling snow. There are several ways of doing this, but in the present instance we shall confine ourselves to one plan only, on account of its simplicity. We allude to the method employed by decorators in making imitation granite. Having roughly cut shields of paper, and laid them loosely on the face and other portions of the negative, which require more careful treatment, the colour is applied in the following manner. Charge a moderately hard tooth-brush with an opaque water-colour—vermilion by preference, tolerably thick to avoid running—and draw it across the teeth of a comb, held a few inches above the negative ; continue the work until a goodly number of splashes have been produced ; the colour should be allowed to set before removing the shields to examine the negative, when, if found satisfactory, a few larger flakes and masses of fallen snow can be readily added with an ordinary touching brush, both sides of the negative being available for further manipulation. The face and other covered portions are completed by removing the shields, and springing small splashes of colour over some of those portions, to a less extent, from a touching brush sparingly charged with colour. When all the colour is thoroughly dry, a proof should be taken, and any necessary modifications made—an easy matter, as the water-colour can be removed with a damp cloth—after which the negative is ready for printing.

WALES ON A METHOD OF MAKING A HIGHLY SENSITIVE GELATINE EMULSION.

Dissolve 24 grammes of pure air-dried potassium bromide in 300 c.c. of distilled water, 30 to 45 grammes of gelatine are introduced, and the whole, after soaking half-an-hour, is placed in a water bath at a temperature of 35° C. to 45° C., till the gelatine has dissolved and become clear ; then take 30 grammes of silver nitrate and dissolve in 300 c.c. of water, and add ammonia drop by drop, stirring all the time till the precipitate formed is re-dissolved, and the liquid becomes perfectly clear.

The above operation can be performed in daylight. Now, by a weak ruby light, add the silver solution to the gelatine, a third at a time, and shake vigorously between each addition, and allow to cool down to 35° C. ; shake again after the whole of silver has been added, and at intervals ; and rinse out remains of silver with 50 c.c. of water. Then replace the bottle in the water bath, which should be at a temperature not exceeding 35° C., let it remain for one hour, allowing the water in the bath at the same time to cool down gradually. The temperature may be allowed to sink as low as 25° C. without any fear ef the gelatine setting; but the quantity of water should be sufficient to prevent the temperature falling lower. In this method the chemicals used should be the best procurable.

The temperature should never exceed 40° C. in the preparation of this emulsion, or fog will be sure to follow. When it has digested the required time, it is poured out into a large dish to set and to cool for a couple of hours, or a larger dish may be partly filled with water, and the one with emulsion placed in it to hasten its setting. After it is thoroughly set, squeezee it through coarse canvas with meshes about 2 to 3 m.m. apart into a large bowl of water, and well stir. Have a box about a foot square by four inches deep, covered with fine muslin or linen, so that the water may be poured out of bowl into box, which will let all water through, but retain the small particles of emulsion. Repeat the washing four or five times, for here lies the resulting rapidity of the plates. After well washing, allow to drain well, for it contains an excess of water which must be got rid of. After well draining, it is put into a bottle, dissolved, and filtered through chamois leather; it is then ready for coating the plates. I will now give a description of the articles I use for heating, filtering, coating, &c.

A zinc tray, 18 inches long by 9 broad and 5 deep, with funnel soldered in near left-hand corner, to stand half-an-inch above the level of tray, so as to prevent any water accidentally going down into jugs whilst filtering. In this zinc funnel I place a glass—one which has a chamois leather spread over. The heat of the water in tray is sufficient to cause the emulsion to filter through rapidly. I have a box let into the dark-room from outside, which has a flange four inches deep all round for the purpose of nailing it to the partition; on one side it has a hole six inches square cut out, and a small box with flange is rivetted on to it, from which the heat in larger box enters. I place my jar to receive the emulsion as it passes through the filter. On the top of large box I place the tray containing the hot water and emulsion bottle, then I place a small oil stove in box from outside, which keeps the heat at any desired temperature; by this contrivance all gases are entirely shut out of the room. A support will be needed under the larger box. For coating, I use two small jugs, one for pouring, the other to receive any surplus from plates coated and returned to filter.

I use slate slabs for setting, and I find these much cooler than glass. For drying-racks, I use shelves the length of the room, with rows of oval holes cut in diagonally, or so that there shall be a space between the first row and third; the holes are cut larger and wider at the top than at the bottom, so as to prevent any part of the plate becoming damaged. I find this plan exceedingly good.

For ventilation I get two stove-pipe elbows, and insert one at one end of the room near the floor; the other I connect with the chimney, thereby securing a good current of air amongst the plates.

I find one thickness of the paper supplied by most stock dealers perfectly safe; it is a good plan to have a thick plate of glass outside to keep inquisitive people from pushing a hole through the paper. I mention this through losing over nine dozen 5 by 8 plates through the attempt of a friend to rear himself up inside my dark-room.

Almost any developer is good for these plates, but I prefer, for out-door work, ferrous-oxalate iron solution, one to four of oxalate solution.

SCHULTZE'S REGISTERING FRAME FOR PRINTING ON WOOD BLOCKS, LITHOGRAPHIC STONES, OR ZINC PLATES.

This invention, which is described in a recent number of the *Archiv*, is intended to enable the operator to observe the wooden blocks as often as may be necessary during the progess of the printing.

The frame R, figure 1, is provided with a sheet of plate glass, upon which the negative is laid; but on this sheet of glass must be placed a diaphragm of mill-board, which should fit the frame exactly, and the opening must be precisely the same size as the negative. This latter is fastened to the mill-board by strips of gummed paper. Inside the frame R, a second frame r, is fastened, and this is hinged upon the studs, x. The studs, x, work in slots, so that the frame r can always be set parallel with the frame R. The wooden block can be fastened tightly by the screws, s, in the frame, r, and be brought back to its first position without difficulty.

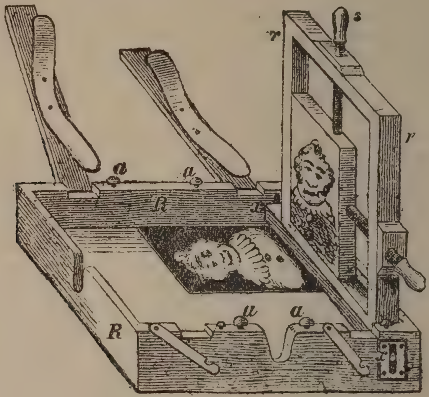


Fig. 1.

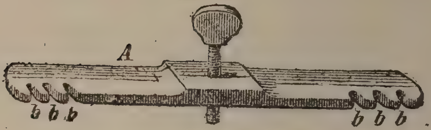


Fig. 2.

For larger copying frames there should be an additional cross-piece (fig. 2), so that extra pressure can be put on the wooden block. The indents, b, of the extra cross-piece, fit the heads, a.

THE DAGUERREOTYPE PROCESS.

In this brief description, as materials and apparatus cannot easily be obtained, a few substitutes that will serve the purpose are suggested. The metal plate to be used must be copper electroplated, and highly polished, as most of the beauty depends upon this.

The next process is the sensitizing. For this purpose get two evaporating dishes or saucers; make a frame to lay on the top to hold the plate; now sprinkle on the bottom of the dish some crystals of iodine, and in the other some lime to which a few drops of bromine have been added; now place the plate over the iodine, and let it remain till it assumes a deep yellow, which may be observed by lifting it and holding it to a white light for a moment; after, place it over the second dish containing the bromine till it takes a rose tint; now again over the iodine (carefully excluding all white light) for about ten seconds. The plate is now ready for the camera. The exposure should be about double that of ordinary collodion. For development, get an ordinary white basin, of about six or seven inches in diameter, and on the top place a frame to hold the plate, and on the bottom a few ounces of mercury. Now place the basin on a stand, and underneath apply a spirit lamp, and heat the mercury to about 140 degrees; in a few minutes the plate can be lifted and examined by the yellow light, and, if not fully developed, should be again placed over the mercury. All this should, of course, be done in the dark room. The plate, as soon as developed, may be taken into the light and placed in a dish of hyposulphite solution, which will instantly remove the sensitizing film. It must now be well washed in distilled water, and afterwards fixed—or, as it is sometimes called, gilded—in the following way. Make a solution of about one grain of chloride of gold to one ounce of distilled water, and into another ounce of water put twenty grains of soda hyposulphite; now pour the gold into th hyposulphite, and filter the solution. The Daguerreotype must now be placed on a levelling-stand with sufficient solution to cover the plate; apply a spirit lamp till the image gets a little darker, and then becomes brighter; then stop, and well rinse with distilled water, and dry off by the lamp.

REDUCING THE DENSITY OF NEGATIVES WITH THE VIEW OF OBTAINING CLEAR SHADOWS.

A SOLUTION of hyposulphite of soda of such a strength as is commonly used for the fixing bath is made up, so also is a saturated solution of red prussiate of potash. Twenty or thirty drops of this latter solution are dropped into each pint of hypo solution, and the negative to be reduced is placed in the mixture. Almost immediately a slight but quite perceptible reduction of density will be seen. The action, however, very soon ceases, and if a greater amount of reduction be desired, a few more drops of the red prussiate solution are added, and this operation is repeated till the desired effect is produced, when the negative is thoroughly washed and dried. By this means negatives "as black as one's hat," which would not print in days of bright weather, may be altered to thoroughly good and rapid printing negatives.

SILVER PRINTING ON ALBUMENIZED PAPER.

The Silver Printing Bath.—Good results are obtained from the use of a plain neutral solution, kept as near as possible to the strength of from forty-five to sixty grains of nitrate of silver per ounce of water; the paper should be floated from three to five minutes.

To prepare a sensitive paper that keeps white for a week or so, nothing has been published that works so well as Mr. Blanchard's formula, given in April, 1879, and is as follows:—Prepare the silver solution, sixty grains to the ounce, and be careful not to allow it to sink lower than fifty grains to the ounce; for each ounce of nitrate used, add ten drops of a saturated solution of citric acid; now add citric acid drop by drop, until the slight precipitate of citrate of silver formed is just re-dissolved. Float from three to five minutes, and upon taking from the bath, place between sheets of clean blotting-paper, which may be used over and over again until their power of absorption is almost destroyed; it being needless to observe that when this stage is reached, the blotting-paper is especially available for the silver waste basket. Paper so prepared has been kept white and good for nine months, and the results, both in the way of the fine, rich, vigorous prints, and ease of toning, leave nothing to be desired.

Toning.—The acetate of soda toning bath still holds its own against the many formulæ for toning that have from time to time been published; and deservedly so, as by its use the utmost range of tone can be secured at will, and if the silver be carefully washed out of the prints previous to toning, the acetate bath will keep in order for a considerable length of time, improving in quality with age, if properly strengthened, and not overworked.

For views, a handy and good toning bath is made by neutralising the chloride of gold with chalk, and using it in the proportion of one grain of gold to ten ounces of water; the formula for the acetate of soda bath being—

Chloride of gold	1 grain
Acetate of soda	30 grains
Water	10 ounces

Another method, of great ease in preparation and uniformity of action, is given by Mr. Werge; it will be found amongst the Standard Formulæ.

Washing the print after fixing is a very important factor in securing lasting prints, and always receives a deal of attention from the careful photographer.

Constant changes of clean water for two or three hours will more effectually cleanse the prints than twelve hours' soaking. A very delicate and ready test for the elimination of soda is given thus in Abney's "Instruction in Photography"* :—

Potassium permanganate	2 grains
Potassium carbonate	20 ,,
Water	1 quart

The addition of a few drops of this rose-coloured solution to a pint of water will yield a slightly pink tinge. If there be any trace of hyposulphite present, this will give place to one of a greenish or brownish hue.

COLLOTYPE FOR AMATEURS, AS WORKED BY C. RELVAS.

THE support for the gelatine printing surface is plate glass about a quarter of an inch thick, and finely ground on the coated side. The plates, having been thoroughly cleaned with nitric acid, washed, and dried, are levelled carefully in a drying box.

The preliminary coating is composed of—

Whites of eight eggs	
Bichromate of potash	8 grammes
Distilled water	400 cub cents.
Glycerine	24 drops
Ammonia	12 ,,

It is spread over the plates with a glass rod, run round like collodion, and the excess poured off. The plate is then replaced in its original position on the levelling screws in the drying-box, and left to dry. When the coating is quite dry, the plate is placed, coated side downwards, on a board covered with black cloth, and exposed to light for twenty minutes, or just long enough to leave the coating slightly soluble on the surface. The plate is then put into warm water for about fifteen minutes to remove the bichromate, and dried again in the open air. The plates may now be kept, or coated at once with the second coating, which is composed of—

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* Piper and Carter, 5, Furnival Street, E.C.

Gelatine (Nelson's No. 2, fine cut)	27 grammes
Distilled water	400 cub. cents.
Bichromate of potash	9 grammes
Solution A	15 cub. cents.
„ B	15 „
Ammonia	12 drops

Solutions A and B are composed as follows .—

Solution A.

Chloride of sodium	10 grammes
Distilled water	500 cub. cents.

Solution B.

Sulphate of alumina	1 gramme
Water	100 cub. cents.

The above is spread on the plates in the proportion of eighteen grammes per square foot. After the plates are coated they are put to dry on the levelling screws in the drying-box, and should dry in about half an hour with an even polished surface, and may be left till the following day before use. The exposure to light is about twenty minutes in the shade, in fine clear weather, with a negative of moderate density. After exposure the plate is washed in cold water for about an hour to remove the bichromate, and then drained and dried. Before printing the plate is treated with a solution composed of—

Glycerine	500 cub. cents.
Solution C	100 „
Distilled water	200 „

Solution C.

Nitrate of magnesia	50 grammes
Water	500 cub. cents.

The object of this is to soften the gelatine surface. It is left on for two hours, then poured off, and the plate well washed and dried. A little linseed oil is then rubbed over the plate, which is again well washed and dried. The back of the plate is carefully cleared of any adhering gelatine or other matter which might cause it to break in the press. The plates are printed in one of Poirier's special presses for collotype printing. The bed carries a lithographic stone on which a flat glass is laid, and embedded in plaster of Paris. The printing plate is fixed in the press by moistening the back of it, and then moving it about on the fixed glass bed until it adheres firmly. Before printing the gelatine surface is well sponged over, and the superfluous moisture taken off with a pad of calico, or with special rollers made for the purpose, covered with cotton cloth or chamois leather. The first inking is given with a grained leather roller, and a glue roller is then used to equalize the inking and give softness to the half tints. The plate is damped with plain water, or with a mixture of equal parts of glycerine and water. The softening solution given above may be used for the same purpose.

LACOMBE'S TELESCOPIC CAMERA.

M. LACOMBE thus describes his arrangement :—

" It is merely necessary to fix a telescope before the objective—the telescope which I use being kept in its place by means of an adapter A (Fig. 1), which screws into the mount of the objective at B. At C is a diaphragm of large aperture."

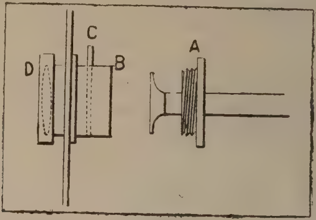


Fig. 1.

" The telescope which I use magnifies about 15 diameters, and as objective I employ a Darlot's combination series, which consists of four glasses ranging from ten to eighteen inches focus, and as regard the general success of the work it makes but little difference which of these is used. The size of the image depends upon the extent to which the camera is extended, and the focussing is managed by adjusting the distance between the eyepiece and the objective of the telescope.

Fig. 2 shows the general aspect of the whole arrangement."

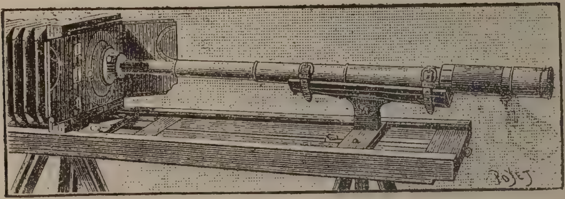


Fig. 2.

M. Lacombe considers it probable that his apparatus may be of considerable service in surveys for military operations, and, indeed, says that he has been thinking out the idea since the war of 1870.

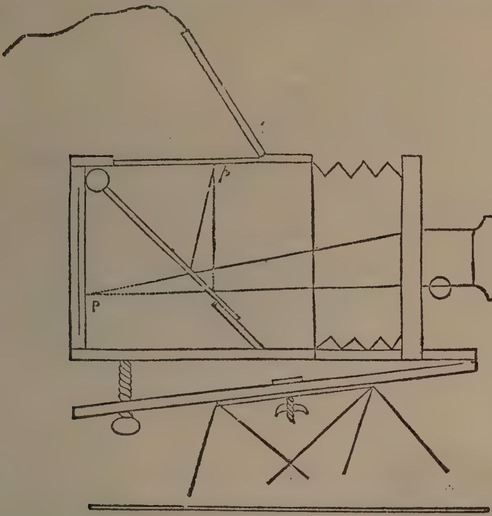
It may be that by taking direct photographs with large and expensive objectives, such as those used by photo-astronomers, and then enlarging the resulting negatives, more perfect results could be obtained than by the portable apparatus designed by M. Lacombe ; but it must be remembered that such objectives require all the appliance of an observatory for successful working, and this practically puts them out of court in all ordinary cases where one shes to hotograph a terrestrial object from a considerable distance.

THE REFLECTING CAMERA.

So many forms of the reflecting camera have been patented and re-patented recently, that it is interesting to look back on some of the early forms of this convenient arrangement.

Sutton's reflecting camera was patented over twenty years ago, but the instrument was not extensively sold, and the patent was allowed to fall through.

The sensitive plate is at P, but for the purposes of focussing, the rays are allowed to impinge on the hinged mirror, shown as placed, diagonally across the camera, and are reflected upon a ground glass plate set into the top of the camera. To expose, the door shown at the top is closed, and the mirror is lifted by turning a button outside the camera. Another form of reflecting camera, and one which was used with a roller-slide, is described in Wall's Photographer's Annual for 1870, p. 22. This apparatus not only involves all the points of Sutton's, but includes a flexible chamber over the focussing glass, and also an eye-piece for magnifying the image.



The figure (p. 184) is a horizontal section of front portion of camera, which is one with the back, but shown disconnected for convenience. A, a reflecting mirror for focussing, the back of which is blackened to prevent reflection when turned against the ground glass (B), which is let into the right hand side of the camera ; the mirror—hinged at the corner—must be placed at such an angle as will make the combined, direct, and reflected rays from the lens exactly of the same length as they would be if they passed direct to the film. When so placed, the picture, when in focus upon the ground-glass, will also be in focus upon the film when the mirror is removed. The proper position for the mirror is half the angle included between the perpendicular and the conical side of the camera. Had the side been horizontal, the angle would, of course, have been 45 degrees. There must be a stop round the interior of the camera for the double purpose of excluding the light from the film while focussing, and stopping the mirror at the proper angle. B, the position of the mirror during exposure. There is a raised ridge round the focussing-glass into which the mirror accurately fits, that no light may get into the camera. C, a focussing-lens let into a frame, and hinged upon a movable portion of the side of the camera, which, when folded down, protects the ground glass during transport.

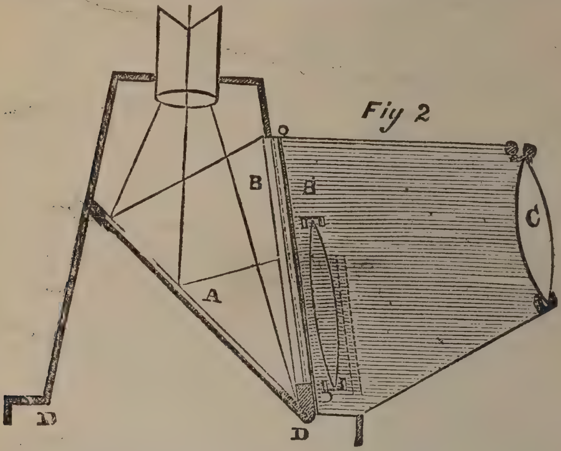
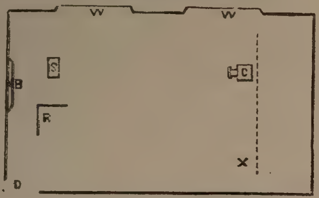


Fig 2

On the top and bottom edges of the movable side is secured a dark cloth, which is also secured to the lens frame and the camera side, forming a dark chamber for focussing purposes, thereby avoiding the necessity of putting the head under a cloth—a decided advantage to lady photographers. B, the position of the camera side, with the lens-frame folded back, and the loose cloth covering the lens, which, when strapped down, makes all secure. D D, a thin projecting ridge inside and around the camera, against which the film presses when the holder is pressed forward, thereby excluding the light from the remainder of the film while exposing. In its normal position, the ridge is about three-eighths clear of the holder. There is also a small curtain—not shown in the sketch—that drops over the lens C to exclude light from the camera while moving the mirror.

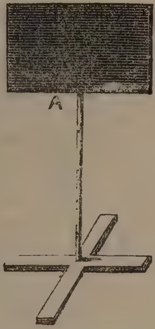
LEWIS ON PORTRAITURE AT HOME.

THE room which is to serve as the studio should be as lofty as possible, and long enough to secure the proper distance between subject and camera. If with more than one window, it is imperative that such windows be on the same side of the room, when the light from all is available. Should the windows be opposite, or at an angle one with the other, then the largest should be selected, and the other or others must be covered, so that all light is excluded from them. The window should be perfectly clean, and if direct sunlight is upon it, a screen of white tissue paper must be hung across, which wil afford a beautifully soft diffused light. The diagram is a ground plan of a drawing-room suitable for photographic portraiture.



B, background, suspended from nail in wall, and hanging by cord attached to the top slip of wood as already described; S. the sitter; R, reflecting C, camera; W W, windows, both of which, being on same side of room, should have the curtains fastened back to admit all available light; D, the door of room, should be kept closed, otherwise a cross light might result.

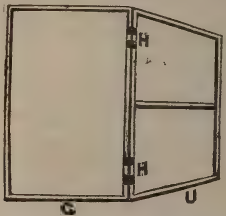
The dotted line in diagram implies that camera may be placed in any part of room between window and wall side, thus getting a different view of sitter.



It is not necessary that the background be moved, so long as image is seen to be in centre of it; the appearance of negative will be satisfactory in this respect. If camera be placed near X, the lens must have a screen to cut off the light which will be seen to enter the hood from the window by the sitter. Such a screen is easily made, and the diagram is readily understood. A is a piece of blackened board, which, supported on its stand, can be placed close by lens, and between it and window, thus effectually shielding from light.

Background.—This should be of suitable tint, and in the absence of a ready made one, such as the "Empire," a fairly good substitute will be found in strong brown paper, such as is used for laying under carpets. This can be purchased in the roll, and is about four feet or more wide; a piece two yards long will, therefore, answer admirably. Tack the top edge to a slip of wood about six inches longer than the width of the paper, and the bottom part to a wooden roller of the same length, which will leave a projecting end of three inches beyond the paper. When required for use, suspend by the top slip to a nail in the wall, letting the roller hang within half an inch of the floor.

Reflector Screen.—To lighten the side of the subject which is farthest from the window, a reflecting screen will be wanted. This can be improvised by a clothes'-horse, which should be about 6 feet high by 3 feet wide; over one wing place a clean sheet, which must be stretched free from creases. A still better reflector is made by joining up a slight framework of wood, say 6 feet high by 3 feet 6 inches wide, over which is tacked a suitable material called "white blind holland," and can be obtained at any draper's. This will be found to reflect more brightly than the sheet, and will be always ready for use. It can be arranged to stand against a chair, or can have a folding wing like a clothes-horse to support it. If the ceiling of the room be in a fairly good white-washed condition—the whiter the better—enough top light will be obtained. A diagram of the reflecting screen, one wing of which is covered with the white material already alluded to, is depicted below.



G is the covered side; U, the supporting wing; H H, the hinges, made of webbing, and allowing the frame to fold either way, like a clothes-horse.

Lens.—The possession of a portrait combination is practically a *sine quâ non* for producing really good work, and the quicker acting the lens, the better the result. A lens of the rapid rectilinear type is the next best, but by those who wish to take likenesses more than occasionally, it will be found necessary to get a good portrait lens. It may be mentioned that the most suitable style of pictures to take will be head and bust down to half-length. It is useless to attempt heads of more than an inch and a-half in size, unless the lens is a specially fine one. Be content with the size picture for which the lens is most suitable, and progress will be made.

Lighting the Sitter.—This is a matter of the greatest importance, and perhaps the most difficult part of the process. The very best advice I can offer is—get a life-size plaster head and bust. These can be bought at a moderate price at shops in the neighbourhood of Bloomsbury. Then place your background, and stand the plaster cast upon a small table in front of it. Now retire about ten feet off, and study how it looks. The eye will be some time before it learns to appreciate the fine gradation of light and shade upon your cast; but keen observation and patience will bring their reward. Presuming the cast is in full-face position, study the lighting without the camera, note the clear white on the window side, the dark shadow just the other side of the nose, and the still darker tone of the ear farthest from the light. Now turn the cast to three-quarter-face, then to profile facing the light, then the reverse way, with the back of head towards the window; observe the appearance leisurely and carefully. After this, go over the whole again, with the addition of the reflecting screen, adjusting it about four feet from the dark side of the cast at right angles to it; now, by moving it nearer to or farther from the cast, you will be able to see when the shaded side is nicely graduated in tone in relation to the light side. Take some negatives of the cast under the various conditions and positions described, and it will go more to enable you to produce a good portrait than fifty haphazard "shots" at a friendly—though more often than not, exasperatingly facetious—sitter. Show what you can do with your cast, and your friends, when they see a good photo of it, will be more than willing to abide by your wishes when you offer to take their portraits. For, after all, the sitter must be willing and steady, or time is simply wasted.

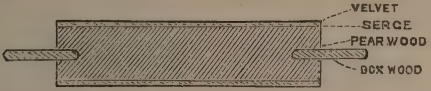
Portrait from Life.—Presuming that the foregoing directions have been carried out, and that several good negatives can be shown of the cast in various positions, there is every hope of success attending an attempt from the life. Before requesting your sitter to "pose," be sure to have your plate in the slide, camera in position, background and reflecting screen adjusted as nearly as can be. Place a chair for the sitter, and focus that, then request your model to occupy the chair; take a good look at the face while you stand close by the camera, with your eyes following the direction of the lens. Place your reflector so as to get the desired light on the shadow side of the face; and remember the frame must be at right angles to the face, for if it slope it will either throw a light from behind the ear, forward on to the cheek, or cast a light into the eye of the shaded side of the face—both being defects to be avoided.

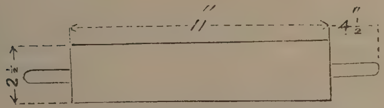
RELIEF ETCHING ON ZINC, OR PHOTOTYPIC ENGRAVING.

THIS process is adapted for the reproduction of originals in clear black-and-white, as for example pen-and-ink sketches.

The first step is to make a photo-lithographic transfer—that is to say, a print on gelatinized paper, in which the lines are formed of a preparation similar to printer's ink. Of the several ways of making the transfer, the following may be recommended:—

Make an inking roller, having a covering of velvet on the outside, and the subjoined measurements are those to be recommended, and in the sections we show the materials of which the roller is made. The *best silk* velvet is most suitable for the purpose. The body of the roller is of pear wood, a light material most favourable to the purpose, while the handles are of boxwood. Over the pear-tree block are sewn two layers of thick serge, and over the latter one thickness of velvet, the price of which is about twelve shillings a yard.





The serge, before it is sewn on, should be scalded in hot water, so that it will not ruck afterwards, and the velvet must be fitted by a skilled seamstress. The so-called carpet stitch is best adapted to the purpose, the ends of the velvet not overlapping, but drawn together so as to meet. In this way the seam is not a ridge, but perfectly flat, and the roller does not set off at this spot. It need scarcely be said that this can only be attained with very fine stitches. The velvet is cut out exactly to size, and sewn on the block.

The roller may be put away in a linen bag as soon as done with, though perhaps it is best to clean first ; the bag keeps away dust, and the grease in the ink will keep the velvet from becoming hard. The roller is passed over a clean slab, and this is scraped from time to time. The slab gradually pulls the ink off, and this is then removed from the slab by scraping. If you are not able to get off all the ink in this way, pass the roller over a sheet of soft paper, and apply a little turpentine. After a little practice you will soon know when the roller is free from ink.

The ink is thinned by the addition of turpentine, so that if at any time it is too thin on slab or roller, a little delay will at once mend matters to allow for the evaporation of the turpentine.

The transfer ink suitable for use with the velvet roller is made by mixing together two ounces of soft commercial lithographic transfer ink, and one-fourth of an ounce of olive oil. This forms the stock ink, and, when required for use, it should be reduced to the consistency of cream with oil of turpentine. It is worked thoroughly into the velvet, and as the turpentine evaporates, the roller acquires the condition most suitable for inking up a transfer on gelatinized paper. The paper is thin bank post made sensitive by floating on—

Gelatine	3 ounces
Water	50 „
Bichromate of potash	2 „

The dry paper is exposed under a dense negative having perfectly clear lines, for about five or six minutes in the shade, and it is then soaked in cold water for a few minutes and blotted off, being inked up with the velvet roller, just as if the paper were a lithographic stone.

It is of importance that the paper should be steadily supported under the roller ; and an excellent method is to leave the sheet a little larger than the subject in one direction, and to double this extra margin under a thick slab of plate glass, after which care is taken always to roll away from the edge which is held. If the plate glass is thick and heavy, its weight will hold the transfer paper in position ; but in other cases the glass may itself be held in a form of vice like the screw plate-holder, and in this case it is only necessary to turn down sufficient of the transfer to grip between the edge of the plate and one jaw of the plate-holder. It will be found that the parts corresponding to the lines of the subject take the ink, and when all the lines are clear and distinct the transfer is complete.

Zinc plates surfaced ready for etching can be obtained commercially from dealers in lithographic material—as for example from Winstone, of 100, Shoe Lane—and after a final clearing of the plate with a mixture of whiting and spirit, polishing off with blotting-paper. All is now ready for impressing the photographic image on the prepared zinc plate, and for this purpose a lithographic press is required ; those generally used in this country being scraper presses. A sufficiently large lithographic stone is laid on the bed of the press, and the scraper is so adjusted as to give a moderate pressure when the zinc plate, three or four thicknesses of blotting-paper, and a glaze-board are laid on the stone. The transfer, or fatty image on gelatinised paper, which is supposed to be already made, is now laid for a few minutes between sheets of damp blotting-paper, in order to so far moisten it as to make it just capable of adhering to the zinc plate when pressure is applied. The polished zinc plate is now laid face upwards on the lithographic stone, after which the transfer is laid face downwards on the polished metal, the blotting-paper and glazed-board are laid over, the tympan of the press is lowered, and a gentle pressure is applied. One corner of the covering is then cautiously turned up in order to ascertain if the transfer adheres well to the zinc plate, and if this is not the case, the pressure is renewed until a satisfactory adhesion is established; the utmost care being of course taken that the transfer does not shift its position on the zinc in the least. When the transfer fairly adheres, the over-lying glazed-board and the blotting-paper may be removed and turned round to a fresh position, after which pressure must again be applied several times. The amount of pressure should be increased each time the plate is passed through the press, and the relative positions of plate and packing should be changed at each pressure, in order to compensate for unequal thickness of the plate or want of accuracy in the construction of the press. It is well now to slightly moisten the back of the transfer with a sponge, and repeat the pressure a few times more, in order to thoroughly impress the fatty device on the zinc; and, at the same time, to loosen its hold on the paper basis of the original transfer. The back of the transfer is now thoroughly wetted, and after the water has been allowed to soak into it, for a few minutes, one corner is lifted, in order to ascertain if it will easily leave the metal plate, and should this not be the case, more time must be allowed. When the paper basis of the transfer has been stripped off, the fatty impression will be seen remaining on the metal plate, scarcely a trace of the printing ink being carried away with the wet paper. The zinc plate is next flooded with water, and its face is very gently rubbed with a soft sponge, in order to remove any trace of gelatinous matter from the spaces between the lines of the device, the plate being next rinsed, and placed in a warm place to dry.

If the zinc plate to which the fatty image has been transferred were immediately placed in the etching bath, there would be a considerable probability of the image becoming cleared off at once, owing to the fact of the lines being so far discontinuous or broken as to allow the acid to permeate through them. In order to render the fatty image capable of resisting the action of the etching fluid, it is necessary to reinforce the lines to such an extent as to convert them into ridges of printer's ink, so far piled up as to preclude the possibility of any trace of acid acting except fairly beyond the area covered by the lines. Before this can be done, however, the general ground of the plate must be so far charged with gum as to enable it to repel the ink. For this purpose, a soft sponge is thoroughly saturated with a strong mucilage of gum-arabic, and after the greater part of the gum has been expelled by gentle pressure, the plate is repeatedly dabbed with the sponge until the gum fairly takes on all parts of the zinc plate which are bare as regards printer's ink. The plate is now allowed to dry without the application of artificial heat. An ordinary lithographic inking roller must be well charged with rather thin printing colour—that is to say, a usual lithographic printing colour slightly thinned with middle lithographic varnish—but before rolling the zinc plate with this mixture it is necessary to once more work it over with the sponge, so as to thoroughly re-dissolve the desiccated film of gum, after which the gum is wiped off with a second sponge moistened with clean water, the zinc plate being thus left uniformly moist, except where the lines of the device exist. The inking roller is now brought into requisition, the still moist plate being thoroughly rolled in all directions, when it will be found that the ink will adhere to the existing ink lines, and will be repelled by the moist metal ground-work. Should any tendency for the ink to soil the ground be noticed, the damp sponge must be immediately passed over the plate a few times with moderate pressure, when it will be found that the previous clearness of the ground will be at once restored. A second gumming should follow, after which the excess of gum must be once more removed by the damp sponge, and the inking operation is repeated until the lines are seen to stand up in distinct relief. In inking the plate it must be remembered that a slow motion and a heavy pressure tend towards the deposition of a large quantity of ink, while a quick motion and a light pressure tend towards the deposition of a thin layer; or these conditions of rolling may even remove ink—that is to say, may reduce a heavy deposit. The same kind of thing holds good as regards the inking slab, quick rolling and light pressure tending to increase the amount taken by the roller, while the quantity on the slab is reduced; and slow rolling combined with heavy pressure serve to reduce the charge on the roller, and increase the amount left on the inking slab. The operations of gumming and inking may often be repeated with advantage five or six times, and care should be taken to pile up as much ink as the lines will hold without any risk being run of any spreading or widening taking place.

A little difficulty may arise from the absorption of water by the leather roller, and this hydrated condition may be recognised by a tendency of the roller rather to slide over the zinc plate, than fairly to bite or hold on it. In such a case, the only way is to take a fresh roller, and allow the first to remain exposed to the air until the moisture evaporates.

The inking or reinforcement of the lines having been sufficiently performed, the plate is well rinsed under a rose, wiped with a sponge, and fanned dry. The plate is next dusted over with finely-powdered asphalt powder, an ordinary broad camel's hair pencil being used for its application, and all excess being then removed by means of a soft powder-puff. Instead of asphalt merely powdered, it is advantageous to use a preparation obtained by melting 15 parts of bitumen of Judea with 1 part of ordinary resin and 1 part of bees-wax; the mixture being next powdered into cold water, and, after having been dried, it is very finely powdered.

The lines on the dusted plate now appear reddish brown, from the presence of the loosely adherent powder; and in order to cause this powder to thoroughly unite with the printing ink, a very gentle heat must be applied by means of spirit lamp or gas flame—never more heat than can be borne easily by the back of the hand, and not more than will just suffice to so far cause the asphalt powder and the ink to unite as to make the surface of the lines shining and glassy, rather than dull brown. When the plate has once more become cold, the edges and back are varnished with an alcoholic solution of shellac, and the varnish applied to the borders should not come nearer to the device than one-third of an inch. The varnish being quite dry, a scratch is made through it near one corner of the plate, the action of the acid on the metal thus laid bare serving as a guide to the progress of the general etching; and all is now ready for the immersion of the zinc plate in the first etching bath, which consists of a mixture of one part of strong nitric acid and 40 parts of water. The dish used for containing the acid should be so mounted on rollers as to render it easy to keep up a constant rocking motion while the acid is acting on the metal, this being necessary in order to prevent unequal action of the acid arising from the accumulation of the black impurities which always remain when commercial zinc is dissolved in an acid. As a rule, the first etching bath ought to be allowed to act for about forty seconds in the case of very fine work, or about eighty seconds in the case of coarse work; but perhaps one minute may be taken as an average. But time certainly ought not to be taken as a guide in the case of important work, it being much better to regulate the duration of the etching by an examination of the test line or stroke made through the shellac varnish used to protect the edges of the plate. For this purpose the shellac is scraped away from the sides of a portion of the line, and the depth of the etching is judged of by feeling with a needle point. A good rule is never to carry the first etching farther than to give a depth corresponding to the thickness of a sheet of thin note paper, and in the case of fine work one-half or one-third of this thickness should not be exceeded. The first etching having been finished, the plate is then well rinsed with water, and is either allowed to dry spontaneously, or is fanned until all traces of moisture are removed.

The lines now stand in relief on the zinc plate, and the subsequent operations are intended to deepen the interspaces so as to fit the block for the printing press.

The lines on zinc plate now stand in relief to a very slight extent indeed, but one might imagine at first sight that if the action of the acid had been allowed to continue very much longer, a much more considerable degree of relief would have been obtained; but as a matter of fact, the nearly vertical sides of the lines would have been so far dissolved by the continued action of the solvent as to finally undermine and cut them off altogether, and this sideward action of the acid is prevented by the next step, which consists in so far warming the plate as to cause the accumulation of ink and asphaltic matter, which is now piled on the lines, to flow down and cover the vertical sides of the relief. The temperature required for this is rather higher than that which was necessary for causing the asphaltic powder to unite with the ink, as previously alluded to; but no precise directions can be given, as samples of asphalt and ink vary much in their physical characteristics. The most convenient method is to place the zinc plate, face upwards, on an iron trellis, and heat it by means of a Bunsen gas burner or a spirit lamp, kept in constant motion, underneath it; an arrangement which renders it easy to watch, with the help of a magnifying glass, the overflowing of the melted material. Over-heating should be guarded against, as certain constituents of the ink are liable to be lost by volatilisation, the remainder becoming brittle and ill-calculated to thoroughly resist the action of the acid. The heating operation having been satisfactorily performed, the plate is allowed to cool.

About equal parts of ordinary lithographic printing ink and middle lithographic varnish are next mixed on the inking slab, and are thoroughly distributed with a moderately soft lithographic roller. By this time the zinc plate will have cooled, and after it has been once more gummed and wiped with a damp sponge, just as previously directed, the moist plate is well rolled with the ink roller, care being taken not to exert too much pressure. The lines thus become charged with a fresh layer of ink; and if any should adhere to the bare zinc, it is probable that the gum has been too thoroughly removed by the damp sponge, that the plate has become too dry, that the ink is too thin, or that over-much pressure has been exercised in inking. When the plate has been several times turned round and thoroughly inked in all directions, it is well washed, so as to free it from all traces of gum, once more dried, and again dusted with the asphalt powder; once more it is very gently warmed, so as just to cause a partial union to take place between the ink and the powder. When the plate is again cool, it is ready for immersion in the second etching bath; but, before this, a careful examination should be made, and any traces of printer's ink which may adhere between lines must be scraped away, so as to lay bare a clean surface of metal. Prior to immersion in the second etching bath, a portion of the border must be laid bare, as explained when the first etching was described; and in ordinary cases the same bath as that previously used may be employed; but the action may be allowed to continue for about twice as long a time, as the bath would necessarily be somewhat weaker than before. It is not advisable, however, to etch a much deeper step than that of the first etching, as such a course might endanger the entirety of the finer strokes of the design, and lead to the failure of the whole work. After the second etching, the plate in once more well washed, drained, and fanned dry; after which it is again heated, so as to cause the resist to run down, and to cover the vertical edges of the second step, and if the subject consists partly of lines separated by extremely narrow interspaces, it will be found that many of these will be blocked or filled with the resist at this stage.

The gumming and re-inking of the plates are now repeated in the same fashion as already described, but as the tendency of the interspaces to become soiled with ink is now considerably reduced, an increased pressure may be exercised on the inking roller; but still this pressure must not be excessive. It is, however, of considerable importance not to neglect the precaution of turning the plate round, so as to bring each edge to the front successively, as if this is not done there is a high probability of inequalities occurring as regards the deposition of ink. Once more the plate is thoroughly washed, dried, and dusted with the asphalt powder, a sufficient degree of heat being then applied to cause the thorough fixation of the powder as before, but not heat enough to cause any flowing over of the resist on to the uncovered parts of the plate. A new test line is made, and the plate once more etched, the old bath being used, but as much strong nitric acid as was originatly used should be added. A considerably greater depth may now be ventured on, generally rather more than that resulting from both the previous etchings taken together. The whole cycle of operations is again repeated, but instead of dusting with asphalt powder it is better to employ finely-powdered resin, this substance being more fusible and running more readily down the sides of the deeper steps which may now be ventured upon. The number of etchings required may vary from six to twelve, but as the work progresses every care should be taken to at once clean off any trace of ink which may become deposited on the blanks, and during the etching a gentle rocking motion of the tray should be invariably kept up. A more fluid ink and a softer roller are also desirable, as the depth of the etched parts becomes greater, in order that the sides of the relief may become fairly inked; while resin, rather than asphalt, ought to be used for dusting. It is often convenient to continue the etchings until the plate is actually perforated in parts; but this will depend on circumstances. Finally, clean with turpentine, trim, and mount.

HOW W. COLES REMOVES VARNISH FROM NEGATIVES.

PUT sufficient methylated alcohol into a pyro bottle, or a new pint paraffin tin, and cork up loosely. Stand this in a saucepan of cold or luke-warm water, having a piece of board between the bottle and bottom of saucepan. Make it hot, preferably over a gas stove, as there is more risk of a conflagration with an open fire. Put the negative face downwards, in a flat dish, propping it up by the corners only, and pour on sufficient hot spirit to cover the negative, placing a flat glass on the top. Renew the alcohol three or four times, at intervals of a minute or so, then wash well with water, if required to intensify or reduce. If a clean dish is used, the alcohol can be added to the stock of varnish; but if the developing dish is made use of, it should first be rinsed with acid, and then washed and dried. Care should be taken not to rub the film until the varnish is dissolved off, or scratches may be produced.

CARBON PRINTING PROCESS.

The exposure under the negative is about twice as rapid as silver paper, and as the progress of printing cannot be watched, as with silver paper, recourse has to be had to an actinometer. The actinometer in general use is Johnson's single tint, a square box containing a roll of sensitized silver paper, the lid carrying a square of glass painted over with a dark chocolate pigment, except a small slit about the centre ; under this slit the silver paper is held, and upon exposure to light darkens to the colour of the paint round the slit. When it is reached, this is called one tint, the paper is pulled forward until a piece of unexposed paper is under the slit, when the same operation is repeated until sufficient exposure has been given ; experience soon enables the printer to tell how many points each individual negative requires, and, with practice, few or no mistakes are made.

The exposure being complete, the image requires development, and here one of the peculiarities of the carbon process asserts itself, as this development must take place from the back, to enable which to be done the print is cemented down upon the paper intended as temporary or permanent support. This is done by soaking the exposed tissue and piece of single transfer paper (a little larger than the piece of tissue) in clean cold water until the tissue, which upon first immersion curls inwards, begins to exhibit a tendency to flatten out. At this stage the two pieces are placed face to face, lifted out of the water, and the squeegee applied vigorously to the back of the tissue. After being allowed to lie between sheets of blotting paper for a few minutes, the tissue, mounted upon its support, is placed in warm water at 100° F., and in a short time the backing paper can be stripped off and thrown away ; now, by gentle laving of the hot water, or pouring from a jug, the pigmented gelatine, unaltered by the action of light, is gradually washed away, leaving the carbon image upon the paper, which, after rinsing in cold water, immersion in a solution of alum, and again rinsing, is hung up to dry.

For Double Transfer Process, see YEAR-BOOK for 1886, or the Autotype Manual.

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SCHUMANN'S ORTHOCHROMATIC METHOD FOR COPYING PAINTINGS.

A BROMIDE plate (gelatine) is used, and no iodide of silver must be present.

Cyanin solution.

Cyanin	1 grain
Absolute alcohol	500 c.cm.

To be well shaken.

The baths.

First bath, for softening the dry plate (two minutes).

Distilled water	200
Strong ammonia	$\frac{1}{4}$ to 4 c.cm.

Second bath, for sensitizing the softened plate (two minutes).

Distilled water	200
Ammonia	2
Absolute alcohol	10
Cyanin solution	5

Or (two minutes),

Distilled water	200
Ammonia	4
Absolute alcohol	10
Cyanin solution	10

The dipped plate is placed quickly on blotting-paper, and quickly and thoroughly dried. Expose soon after the plates are prepared, as they lose strength by keeping. Use, also, fresh baths, as they are liable to decompose rapidly.

The development of cyanin plates requires great care; it must be done slowly with a weak developer.

IRON OR CYANOTYPE PRINTING (BLUE PROCESS).

No. 1.—Ammonia citrate of iron	2	ounces
Distilled water	8	,,
No. 2.—Ferricyanide potassium	2	,,
Distilled water	8	,,

Mix the two solutions, and keep in a darkened bottle. Take unglazed paper of a fine grain, and damp the sheets you propose to sensitize. With a sponge or broad brush float the solution over the paper as evenly as possible, and hang to dry in a darkened room. Do not prepare a larger quantity than you are going to shortly use, as the paper becomes slower by keeping. When printing, expose until the shadows assume a strong metallic grey colour, and detail begins to be lost. Wash well in cold water until, when held up by the corner, the drip from print shows no yellow tinge. If it is desired to write in white on the print, use a solution of caustic soda as ink, and a clean steel pen to write with.

Standard Formulæ and Memoranda.

STANDARD FORMULÆ.

MEMORANDA.

DEVELOPING GELATINO-BROMIDE PLATES.

For making plates, *see* EXPERIENCES, PROCESSES, &c.

Usual Pyro Developer.

No. 1—Strong liquid ammonia	...	1¾ ounces
Bromide potassium	...	200 grains
Water	...	80 ounces
No. 2—Pyrogallic	...	30 grains
Water	...	10 ounces

In case of an ordinary exposure, mix equal volumes.

Bedford's Developer for Plates Giving Green Fog.

1.—Pyrogallic acid	...	4 grains
Sodium bisulphite... ...	...	12 ,,
Distilled water	...	1 ounce
2.—Sodium carbonate cryst. ...	...	96 grains
Water	...	1 ounce

The bisulphite of soda should be first dissolved in the water, and the pyro then added. Both solutions may be made up in quantity, as they will keep for some weeks; and for a normal developer they are mixed in equal parts, or the proportions may be varied to suit exposure. If any restrainer is required, use potassium, not ammonium-bromide. One grain to each ounce considerably retards development.

Beach's Developer.

Pyro Solution.

Warm distilled water	...	2 ounces
Sulphite soda (chem. pure)	...	2 ,,

Dissolve; and when cold, add—

Sulphurous acid ...	...	2 ounces
Pyrogallic acid ...	...	½ ounce

Potash Solution.

A	Water	...	4 ounces
	Carb. potash (chem. pure)	...	3 ,,
	Water	...	3 ,,
	Sulphite soda (chem. pure)	...	2 ,,

A and B are now combined into one solution, which will measure between eight or nine fluid ounces. To develop an 8½ by 6½ plate which has had a drop-shutter exposure, take water 3 ounces, and add thereto half an ounce of No. 1 and 3 drams of No. 2 of the potash solution, increasing the latter to 5 drams in case the image hangs back. For a plate which has had the proper exposure, or which has been somewhat over-exposed, add to the 3 ounces of water 3 drams of No. 1 and 1 dram of No. 2. After a minute's time, if the image fails to appear, add a second dram of the potash, repeating the additions at intervals of a minute until developing commences.

Oxalate Developer.

No. 1. Saturated solution of neutral oxalate of potash. To 1,000 parts of this add 3 parts saturated solution of bromide of ammonium.

No. 2. Saturated solution of sulphate of iron. To 1,000 parts of this add 2 parts saturated solution of tartaric acid.

For use, take 4 parts of No. 1, to 1 part of No. 2. If picture is under-exposed, add a little more of No. 2, or use No. 1 made up with less bromine, or even none.

A Sulphite Developer.

Water	2 ounces
Citric acid...	1 ounce

When dissolved, this produces three ounces of solution.

No. 1.—Pyro Solution.

Citric acid solution as above ...	40 grains
Pyrogallic acid	1 ounce
Water	12 ounces

No. 2.

Sulphite of soda (crystals) ...	4 ounces
Carbonate of potash	4 ,,
Water	20 ,,

The developer is made as follows :—

No. 1	1½ drams
No. 2	1 dram
Water	3½ ounces

If the picture comes out too slowly, increase the amount of No. 2 a little at a time.

Eder's Soda Developer with addition of Ammonia.

Prepared as follows :—

A.—Distilled water	1,500 cub. cents.
Neutral sulphite of soda ...	100 grammes
Pyrogallic acid	15 ,,
B.—Distilled water	500 cub. cents.
Pure crystallized carbonate of soda	50 grammes
Strong ammonia solution ...	2½ cub. cents.

Both solutions are to be kept in well-stoppered bottles. A will keep good for two or three weeks; B for several months.

For use, one mixes 100 parts of A with 20 parts of B, and as this mixed developer will keep for a day in a well-stoppered bottle, sufficient for a whole batch of plates may be mixed at once. In this developer the image should appear in ten to fifteen seconds if

STANDARD FORMULÆ.

the exposure has been correct, and the development should be completed in four to six minutes.

If over-exposure is feared, the developer is diluted with half its bulk of water, or a commencement should be made with some of the developer which has been used for previous plates.

If, on the other hand, it is desired to force the development, there is added to each 100 cubic centimetres of the developer 2 to 5 drops of the following solution, (C).

C.—(Accelerator).

Strong ammonia solution	50 cub. cents.
Water	150 ,,

The developer may also be made more active by increasing the proportion of B.

Egli and Spiller's Hydroxylamine Developer.

A.—	Hydroxylamine hydrochlor.	32 grains
	Citric acid	15 ,,
	Potassium bromide ...	20 ,,
	Water	1 ounce
B.—	Caustic soda	1 drm. (60 grs.)
	Water	1 ounce

To develop a 7½ by 5 plate, I take 1 drachm of A, 3½ ounces of water, and to begin with 40 drops of B; then, as the operation proceeds, another 20 or so are addded, *if necessary.*

Cowan's Solution of Pyrogallic Acid Ready for Use.

Pyrogallic	1 ounce
Citric acid	60 grains
Water	109 ounces

Dissolve the citric acid in water, and add the pyrogallic. The solution will contain 4 grains of pyrogallic to the ounce of water, and will keep good for months. For convenience, half the quantity of water may be used, when the strength will be 8 grains per ounce. In using it, dilute according to formula employed.

Abney's Method for Increasing the Sensitiveness of the Ferrous-Oxalate Developer.

Add 10 to 40 drops, according to requirement, of a 25-grain solution of hyposulphite to each 3 ounces of developer.

Cowell's Clearing Solution.

Alum	2 parts
Citric acid	1 part
Water	10 parts

Edwards' Clearing Solution.

Alum	1 ounce
Citric acid	1 ,,
Sulphate of iron	3 ounces
Water	20 ,,

This should be freshly mixed.

Eder's Method of Intensification.

The negative is whitened by soaking in saturated

MEMORANDA.

solution of mercuric chloride, and after thorough rinsing immersed in—

Potassium cyanide	10 parts
Potassium iodide	5 ,,
Mercuric chloride	5 ,,
Water	2,000 ,,

As film becomes dark brown, the actinic opacity is increased; but prolonged action causes brown tint to become lighter, until at last the negative is no denser than at first.

To Intensify Gelatine Negatives with Mercury (Ammonia Method).

Bichloride of mercury, saturated solution in cold water. (The negative should be placed in alum for a short time before treatment.) Well wash the negative, and immediately pour on mercury solution; do not keep it on too long unless the negative is very thin. Wash well, and immerse in bath of—

Water	10 ounces
Ammonia	10 drops

Leave plate in this solution until the black colour goes quite through the film. Well wash. If the mercury solution makes the negative too dense, dilute with water.

Scolik's Method of Mercurial Intensification.

The fixed and well-washed negative is allowed to remain in the following mercuric chloride bath until the film is thoroughly whitened :—

Mercuric chloride	1 part
Potassium bromide	1 ,,
Water	50 parts

The bleaching being complete, the mercuric solution is rinsed off, and the negative is immersed in a mixture of equal parts of saturated solution of sodium sulphite and water; the darkening action will be seen to take place steadily and slowly, just as when ammonia is used. Wash away the excess of sulphite.

Method for Quickly Drying Gelatine Negatives.

After well washing, place plate in a bath of methylated spirit for two or three minutes. Afterwards flow two or three times with common methylated sulphuric ether. The negative will dry in a current of air in two or three minutes.

To Prevent Frilling.

Soak plate before development in saturated solution of Epsom salts. Wash and develop as usual, or use water containing a little Epsom salts, half an ounce or more to a pail of water.

To Remove Yellow Colour from Gelatine Negatives.

After fixing, soak as long as necessary in a strong solution of alum. The plate may be left, if necessary, ten or twelve hours in alum solution.

COLLODION PROCESS.

For details and manipulations, *see* Processes.

Substratum.

Whites of 2 eggs well beaten, 6 pints of water, and 1 drachm liquid ammonia.

Collodion.

Sulphuric acid	6 ounces
Nitric acid 1·450	4 ,,
Water	2 ,,

The temperature will rise to 170°. Wait till it cools down to 100°. Immerse dry cotton-wool (best carded and of long fibre). Be sure wool is dry. Draw it in long flakes, and pull it under acids with stout piece of glass. Do not crowd in too much. Take care each tuft is well wetted before putting in fresh tuft, carefully cover vessel, and put it where any slight fumes may escape. Leave for at least twelve hours—twenty hours will not spoil it. When ready, lift cotton out, and plunge in large quantity of water quickly, separating tufts with glass rods or bars of stout glass. Wash in changes of water till no acid is left. Wring cotton in coarse towel as dry as possible, and then pull out tufts, and place in the air to dry. Collodion made with this cotton will be very soluble, and will leave no sediment. Five to six grains will dissolve in one ounce of mixed ether and alcohol, and still the collodion will be very fluid.

To Prepare one pint of Collodion with above.

No. 1.—Alcohol	5 ounces
Sulphuric ether	10 ,,
Cotton as above	100 grains

To Iodise.

No. 2.—Alcohol	5 ounces
Iodide of ammonium ...	60 grains
Iodide cadmium	30 ,,
Bromide cadmium	20 ,,

Shake till dissolved, and then pour into No. 1.

Another plan, better for small quantities:—

Dissolve the iodides, as above, in 10 oz. of alcohol, then put in 100 grs. of cotton, and shake well. Lastly, add 10 oz. of ether, and shake till cotton is dissolved. This collodion will be ready for use in a few hours, but will improve with age.

Saturated Solution of Iron.

Fill a Winchester quart three parts full of crystals of protosulphate of iron, and add one ounce of sulphate of copper or zinc. Fill up with water, shake well repeatedly. Carefully cork bottle, and lay it gently on its side until next morning. Again shake, and the solution will be ready for use. Always keep full up to stopper with water. Always have the bottle half full of crystals. The use of the sulphate of copper or zinc is to prevent the formation of sediment of persulphate of iron.

Developer with above Solution.

Iron protosulphate (sat. sol. as above)	2 fluid ounces
Acetic acid	1 ounce
Water	20 ounces

Iron Developer for Negatives.

Protosulphate of iron (sat. sol.)	2 fluid ounces
Sulphate of copper	1 drachm
Nitrate of baryta	1 ounce
Glacial acetic acid	½ ,,
Water	20 ounces

When dissolved, filter out white deposit, and keep closely corked.

Henderson's Iron Developer.

Protosulphate of iron ...	20 grains
Glacial acetic acid	20 minims
Alum...	40 grains
Water	1 ounce

Nitrate of Iron Developer for Ferrotypes.

Protosulphate of iron ...	1½ ounce
Nitrate baryta	1½ ,,
Nitric acid	20 drops
Water	20 ounces

When dissolved, filter from dense white deposit of sulphate of baryta, and keep in closely-corked bottle. N.B.—It rapidly spoils when exposed to the air. Pictures by this process are of a very brilliant pearly white.

Intensifying Solution for Wet-Plate Negatives.

No. 1.—Protosulphate of iron (sat. sol.)	2 ounces
Acetic acid	1 ounce
Citric acid...	½ ,,
Water	20 ounces

Silver solution, as much as is necessary to make negative dense.

No. 2.—Pyrogallic acid	10 grains
Citric acid...	25 ,,
Distilled water	2 ounces

Add a few drops of nitrate of silver solution, 10 grains per ounce.

Developer for very Delicate Transparencies.

Pyrogallic acid	3 grains
Citric acid...	1 grain
Water	1 ounce

This development is slow, but the deposit is very fine. Tone with gold, 1 grain to 10 ounces of water.

PRINTING PROCESSES.

Sensitizing Bath for Albumenized Paper.

See information under PROCESSES, Silver Printing.

Durable Sensitized Paper.

Float the albumenized paper on a 10 per cent. solution of nitrate of silver for four minutes, draw it over the glass rod to drain, and then float the back of the sheet for a like period upon a bath composed of

Citrate of potash	1 part
Water	30 parts

Final wash in rain water.

Debenham's Method.

Sensitize by the usual nitrate solution, with the addition of ten drops of perchloric acid to each ounce of the sensitizing bath.

Preservative Book for Sensitized Paper.

Soak thick blotting-paper in a saturated solution of bicarbonate of soda, and when this is dry, make a book of it. Keep the sensitive paper between the leaves of this book: the sheets being kept in pairs, face to face.

Ashman's Durable Paper.

Immediately after sensitizing, float the paper, back downwards, on the following for five minutes. On removal, dry as quickly as possible.

Water	100 parts
Gum arabic	3 ,,
Hydrochloric acid	2 ,,
Citric acid	2 ,,
Tartaric acid	2 ,,

Ashman and Offord's Citro-Chloride Paper as a Substitute for Albumenized Paper.

Prepare as follows:—

A.—Citric acid	20 grains
Water	100 minims

Liquor ammonia sufficient to nearly neutralize, but to leave the solution distinctly acid.

B.—Gelatine (white, hard)	45 grains
Water	1 ounce

Mix A and B.

C.—Gelatine	45 grains
Water	1½ ounces

Soak and dissolve by a gentle heat.

D.—Silver nitrate	40 grains
Water	3 drams

Mix C and D, then all altogether at lowest possible temperature. Set, wash in three changes of water for five minutes, rinse in methylated spirit, then melt, and coat the paper, print, tone, and fix as usual with albumenized paper.

Werge's Gold Toning Bath.

No. 1.—Borax ... ... 1 ounce dissolved in hot water; when all dissolved, dilute to 80 ounces. Keep this in Winchester quart as stock solution. To tone, take for each grain of gold 8 ounces of above solution; mix. The bath is ready for work at once.

No. 2.—Chloride of gold	1 grain
Acetate of soda	20 grains
Water	8 ounces

Lime Toning Bath.

No. 3.—Chloride of gold	1 grain
Whiting	30 grains

Pour on eight ounces of boiling water, and stir. Now add one drop of saturated chloride of lime solution. When cool, bath is ready for use.

No. 4.—Chloride of gold	... ...	1 grain
Bicarbonate of soda ...	...	3 grains
Water	...	8 ounces

To be used at once.

No. 5.—Chloride of gold	... ...	1 grain
Phosphate of soda	...	30 grains
Water	...	8 ounces

Tungstate of Soda Toning Bath.

Tungstate of soda...	... ...	20 grains
Chloride of gold ...	... ...	1 grain
Boiling water ...	... ...	8 ounces

As soon as cold it is ready for use. Can be used again by merely adding gold enough for the day's toning a few minutes before required for work. With each grain of gold add a grain or two of tungstate of soda.

Chloride of Lime Toning Bath.

Chloride of gold	2 grains
And add—	
Precipitated chalk...	20 grains
Saturated solution chloride of lime	2 drops
Boiling water	16 ounces

It may be used as soon as cool; but better results are obtained after ten to twenty-four hours.

To Prevent Blisters.

Immediately after toning immerse in a mixture of four parts methylated spirit and one of water.

Collodion Enlargements—Croughton's Method.

Soak polished flatted crown glass in soda for some time. After well washing, immerse in weak sulphuric or hydrochloric acid, say one ounce to quart of water. Rinse well, and dry with clean cloth. Polish with wash-leather. Well wax polished side of glass with waxing solution made as follows:—

Yellow bees'-wax	1 drachm
Benzole	3 ounces

Use weak acid bath of nitrate of silver. Develop with iron as follows:—

Protosulphate of iron ...	6 drachms
Glacial acetic acid	2 ounces
Citric acid	60 to 80 grains
Sugar-candy	30 ,,
Water	20 ounces

Fix in hyposulphite 4 ounces to pint of water. Well wash. For transfer, use Autotype double transfer paper. Soak twenty minutes in cold water. Now place paper in hot water till surface feels slimy. Place face down on the wet collodion surface, and gently squeegee. When dry, the picture will come from glass.

Printing on Fabric.

Remove all dressing from fabric by boiling in water containing a little potash, dry, and albumenize with ammonium chloride 2 grammes, water 250 cubic

STANDARD FORMULÆ.

centimetres, and the white of 2 eggs, all being well beaten together. A 70-grain silver bath is used, and the remaining operations are as for paper.

Collodio-Chloride Process.

16-gr. alcoholic sol. nit. sil., 1 oz. (by pounding silver salt with methylated spirit in a mortar).

Sulphuric ether	1 ounce
Pyroxyline	12 to 14 grains

When dissolved, add 1½ dr. 16-gr. alcoholic sol. chloride calcium; shake well, and keep carefully from light. A sizing of arrowroot should be applied to paper before pouring on collodio-chloride.

The Pellet Process.

Gum	25 grammes
Common salt	3 ,,
Perchloride of iron ...	8 ,,
Tartaric acid	4 ,,
Water to make up to	100 cub. cents.

The coating should be on a highly sized and smooth paper, similar to good writing paper, as it should not sink in.

Develop with sat. sol. of ferrocyanide of potassium.

Fix in a 10 per cent. aqueous solution of hydrochloric acid.

Carbon Tissue and Transfer Papers.

See Processes. Make a jelly as follows:—

Nelson's transparent sheet gelatine	10 parts
White sugar	4 ,,
Water	25 ,,

Soak the gelatine in the water until soft, then gradually raise the temperature until the gelatine is dissolved, add the sugar, and well agitate. When set, turn the jelly out, and cut off the bottom portion so as to get rid of any grit that may have settled down, and the jelly is ready.

For a tissue giving a good photographic purple brown, take—

Vegetable black	72 grains
Alizarine lake	60 ,,
Indigo	13 ,,

Grind these with about four ounces of melted jelly, using muller and slab or cone paint mill, add to 6 pounds of the above-mentioned plain jelly, and mix well. The ready-ground water-colours sold in tubes may be used, but it is difficult to ensure making one tissue of definite composition. In ordinary cases one may estimate the tube colours to contain about half their weight of colour.

Black tissue—

Jelly	2 pounds
Paris black pigment ...	50 grains

Red or Bartolozzi tissue—

Jelly	2 pounds
Venetian red...	3 ounces
Indian ink	8 grains

MEMORANDA.

Transparency tissue—

Jelly	2 pounds
Indian ink	200 grains

The tissue compound being made, it is strained through muslin into a dish, this standing in a larger dish containing hot water.

The paper to be coated is now rolled up tightly face outwards, and the roll is laid upon the surface of the tissue compound, the loose end being gradually raised, when the surface of the paper will gather up a thin and even coat of pigmented gelatine. The length of paper being coated, it is placed over a stick and allowed to dry.

For making double transfer paper, take of—

Hard gelatine...	1 pound
Fine sulphate of baryta or permanent white	8 ounces
Water	5 pints

Mix these thoroughly, and stir into the mixture a solution of 50 grains of chrome alum in four ounces of water.

For a single transfer paper take—

Hard gelatine...	1 pound
Water	5 pints

When dissolved, add 300 grains of chrome alum dissolved in a pint of water; this will make the liquid somewhat thick and ropy, but sufficient acetic acid must be added to restore it to its original fluidity.

Paper is coated with either of these two compounds in the same way as with the tissue compound.

Sensitizing Bath for Carbon Tissue.

For manipulations and details of carbon process, *see* PROCESSES.

Bichromate of potash ...	1¼ ounce
Methylated spirit	4 ounces
Ammonia	1 drachm
Water	30 ounces

The ammonia helps to keep the tissue soluble. The spirit enables it to be dried at a higher temperature.

Burton's Method of Sensitizing Carbon from Back.

Bichromate Solution.

Water	20 ounces
Liquid ammonia	1 ounce
Bichromate of potash ...	4 ounces

Cut up tissue some time before use, and place under a weight to flatten. When ready for use, place face downward, and spread solution with a sponge, or, better still, a Blanchard brush. Take care it is uniformly wet, say for three minutes, and then pin up to dry. This method is very useful where large sheets are wanted.

Printing on the Wood-Block (See also PROCESSES, &c.)

Mix a solution of nitrate of silver with one of oxalate potassium, and collect the white precipitate on a paper filter, wash a few times with water, after which shake the precipitate up with a 20-grain solution of silver nitrate. Now collect and dry the precipitate without washing, and next rub the white powder on the block, and expose. All the above operations must be done in the dark-room. The image is fixed (against moderate exposure to light) by pressing against it a piece of blotting-paper moistened with a saturated solution of common salt, to each ounce of which 30 drops of hydrochloric acid have been added.

Enlarged Paper Prints by the Powder Process.

Make an enlarged transparency, and varnish it; work up as much as necessary with lead pencil. Now take clean glass plate of the same size. Rub well with French chalk, slightly dust. Coat with plain collodion (iodized collodion will do if plain collodion is not ready to hand). When dry, coat with one of the sensitive mixtures for powder process given above. Dry perfectly over gas stove or spirit lamp in dark room. While still warm, print under the transparency, about three to ten minutes, according to light. The image will be faintly visible. Dust on, with large camel's hair brush, finely-powdered ivory black with a little Indian red or any other colour according to taste. When fully developed, cover with collodion, and place in dish with slightly acid water. When all the yellow is washed away, let the plate dry. To transfer, take a piece of Autotype double transfer paper, soak in warm water till slimy. Wet the plate, and apply paper. Squeegee, and let dry. If all has gone well, it should leave the glass readily. These prints are of course permanent.

Platinotype Process.

Expose the sensitized paper under a negative as usual; time about one-third for ordinary albumenized paper. Print may be examined in feeble light; a faint image will be visible. To develop, take a solution of potassic oxalate, and heat up to 170° to 180° in glazed iron dish. Potassic oxalate solution to be as follows:—

Potassic oxalate	130 grains
Water	1 ounce

Draw print face downwards slowly over the above hot solution, taking care to avoid air-bubbles. For over-exposed prints, lower the temperature of bath to 80°. For under-exposed prints, increase temperature to 190°. Great latitude of temperature is possible, according to requirements. After developing, the print is immersed in weak solution of hydrochloric acid as follows:—

Hydrochloric acid	1 ounce
Water	80 ounces

Prints to remain in acid bath ten minutes, and afterwards washed in three or four changes of water during half-an-hour.

VARNISHES.

Varnish for Wet Plate Negatives.

Methylated spirit	12 ounces
Light amber shellac	1½ ,,
Sandarac	1½ ,,
Canada balsam	½ drachm
Oil of lavender	½ ounce

Ashman's Varnish for Dry Plates.

Commercial "Japanners' gold size"	1 part
Refined benzole	1 ,,

The plate should be thoroughly dry, but not warm; drain off the excess of varnish, and allow the plate to dry during the night. If benzoline or turpentine is used instead of refined benzole, the result is less satisfactory, and a longer time is required for drying. In warm, bright weather the above varnish will often dry in half an hour.

Fritz Luckardt's Retouching Varnish.

Alcohol	300 parts
Sandarac	50 ,,
Camphor	5 ,,
Castor oil	10 ,,
Venetian turpentine	5 ,,

Varnish to Imitate Ground Glass.

Sandarac	18 parts
Mastic	4 ,,
Ether	200 ,,
Benzole	80 to 100 ,,

Black Varnish.

Benzole	10 ounces
Oil of turpentine	1 ounce
Masticated rubber heated until it fuses	100 grains

Dissolve, and add crushed asphaltum, 4 ounces.

VARIOUS.

Water-tight Preparation for Wooden Dishes.

Common brown resin	½ pound
Bees'-wax	2 ounces

Melt together in tin pan (preserved-meat tin will do); when quite fluid, run solution rapidly all over where required. Wood must be perfectly dry and warm.

A Colour for Coating Machinery previous to Photographing.

Dry white lead	5 pounds
Lamp black	2 to 5 ounces
Gold size	1 pint
Turpentine	1½ pints

The amount of lamp-black is varied to suit machine or lighting. This paint is easily removed with turpentine.

Waterproof Glue for Wooden Dishes.

Soak ½ pound of best glue in cold water until quite soft, melt in glue kettle. When quite dissolved pour in 1 ounce of hot saturated solution of bichromate of potash, and well stir. It is now ready for use; apply with brush. Put the article so treated to dry in full daylight for a day or two, and then apply strong alum solution. The vessel is now ready for use, but must be washed first.

To Clean Negatives Stained by Silver.

Take a plug of cotton-wool and well wet it with a weak solution of cyanide of potassium, rub gently all over the negative, using a little more force on the stained parts. Well wash. Dry on blotting-paper. If necessary to re-varnish, flood the plate once or twice with methylated spirit. Let dry, and then varnish in the ordinary way.

Mounting Solution for Prints, Scrap Books, &c.

Soak half-a-pound best glue in cold water till soft. Melt the glue in kettle or earthen jar standing in a saucepan. When quite thin, pour in gradually methylated spirit, stirring well between each addition until quite clear. Strain through coarse muslin into bottles. Well cork, and store away for use. When wanted, stand bottle in hot water till glue is melted.

This is especially adapted for mounting photograps on *thin* mounts.

A Good Mounting Preparation for General Use.

Arrowroot 4 ounces; mix with 4 ounces of water, and pour in 20 ounces of water with constant stirring. When cold, add 1 ounce of gelatine, and as soon as this is swelled, set the vessel in hot water and boil the water in the outer vessel until a uniform mixture is obtained. Finally add—

Alcohol	4 ounces
Carbolic acid	1 drachm
Ammonia	1 ,,

Adam-Salomon's Method of Reducing Over-printed Proofs.

Immerse for a short time in a solution made as below—

Cyanide of potassium ...	5 grains
Liquid ammonia	5 drops
Water	1 pint

Carefully watch the prints, and well wash afterwards.

Adam-Salomon's Encaustic Paste.

Pure virgin wax	500 parts
Gum elemi	10 ,,
Benzole	200 ,,
Essence of lavender	300 ,,
Oil of spike	15 ,,

Encaustic Paste.

Best white wax (cut in shreds)	1 ounce
Turpentine	5 ounces

Dissolve with gentle heat, and pour out in pomatum pot. If too hard when cold, add a little more turpentine.

To Fill Cracks in Varnished Negatives.

Take finely-powdered lamp-black, and rub gently, with circular motion, all over the negative. Use the finger or soft piece of wash-leather for the purpose. If properly done, the cracks will almost disappear.

To Give a Matt Surface to Prints on Albumenized Paper.

Mount the print in the ordinary way, but be careful to avoid any lumps. Well roll, and then sift on finely-ground pumice powder. Rub gently with palm of the hand, using circular motion. Examine from time to time. Continue operation until the proper surface is obtained.

Backing Plates to Prevent Halation.

A solution of bitumen in coal tar naphtha; Brunswick black, or the black varnish described above.

To Clean a Tarnished Daguerreotype.

Take a 3 per cent. solution of cyanide of potassium, and, after well washing silver plate, pour it on gently, and keep it in motion. Do not keep solution long on plate, but pour off and well wash. Should the tarnish still remain, pour on more of solution, and repeat operation till the plate is clean; finally, wash with distilled water, and dry over gas flame or spirit lamp, blowing on plate all the time to drive off the water evenly.

How to Print a Cracked Negative.

Either put printing frame at the bottom of a narrow box, 2 feet deep, with blackened sides, dropping a sheet of light tissue paper over the frame; or suspend from a roasting-jack a board upon which a printing frame can rest, the roasting-jack acting all the time of printing. No trace of crack should then be on the print.

Fol's Backing Sheets for Dry Plates.

Gelatine	1 part
Water	2 parts
Glycerine	1 part
Indian ink	a small addition

Make a paste, and coat strong paper or shirting; place the prepared material, face downwards, on waxed glass to set. Press to back of plate before putting into dark slide.

Note.—A cubic centimetre is equal to the volume of a gramme of water.

TABLES

FOR THE CONVERSION OF GRAMMES (OR CUBIC CENTIMETRES) INTO OUNCES AND GRAINS.

CONVERSION OF GRAMMES INTO GRAINS.

Grammes	Grains
1	15·43
2	30·86
3	46·29
4	61·73
5	77·16
6	92·59
7	108·03
8	123·46
9	138·89

CONVERSION OF GRAINS INTO GRAMMES.

Grains	Grammes
1	·0648
2	·1296
3	·1944
4	·2592
5	·3240
6	·3888
7	·4536
8	·5184
9	·5832

CONVERSION OF GRAMMES INTO TROY OUNCES.

Grammes	Troy ounces
1	·03215
2	·06430
3	·09645
4	·12860
5	·16075
6	·19290
7	·22505
8	·25720
9	·28935

CONVERSION OF GRAMMES INTO AVOIRDUPOIS OUNCES.

Grammes	Avoirdupois ounces
1	·03527
2	·07054
3	·10581
4	·14108
5	·17635
6	·21162
7	·24689
8	·28216
9	·31743

The above tables render the conversion of the weights in question a matter of great ease, the error introduced in the last decimal place being trivial.

The use of the tables will be best illustrated by an example. Supposing that it is desired to find the equivalent in grains of 324·51 grammes, we proceed by breaking up this number into the following series of constituent parts, and finding the grain-equivalent of each part from the table.

Portions of original number	Equivalents in grains
300·00	4630·
20·00	308·6
4·00	61.73
·50	7·716
·01	·1524
	5008·1984

The required quantity is 5008·2 grains. The numbers taken from the table will, in most cases, require a change as regards the position of the decimal point; thus, to find the value of 300 grammes, one refers to the table, and finds 46·30 given as the equivalent, and a mere shifting of the decimal point two places towards the right multiplies this by 100, or gives the required number. In a similar manner, by shifting the decimal place of 30·86 one place to the right we obtain the value in grains of 20 grammes; while the number 61·7 is taken from the table without alteration as the equivalent of 4 grammes. For ·50 the table number must have its point shifted on to the left, making it 7·716 instead of 77·16; and ally, the value of ·01 is obtained by shifting the point of 15·43 two places to the left.

The above operations are, in actual practice, performed with considerable speed, the required equivalents being written down one after the other on a scrap of paper, and then added up.

DR. JANEWAY'S TABLE OF THE SOLUBILITY OF PHOTOGRAPHIC CHEMICALS.

Made for the Society of Amateur Photographers of New York.

Abbreviations.—s. soluble; ins. insoluble; sp. sparingly; m. moderately; v. very; alm. almost; dec. decomposed.

CHEMICALS.	WATER. 59° F.	WATER. 212° F.	COLD ALCOHOL.
One part is soluble in	Parts.	Parts.	
Acid, Citric	0·75	·6	v. s.
Gallic	100	3	m. s.
Oxalic	8	1	v. s.
Pyrogallic	3·5	v. s.	v. s.
Tannic	6	v. s.	v. s.
Alum	10·5	v. s.	ins.
Chrome	10	dec.	ins.
Ammonium, Nitrate	0·5	v. s.	v. s.
Chloride	3	v. s.	sp. s.
Carbonate	4	dec.	m. s.
Sulphocyanate	v. s.	v. s.	v. s.
Bromide	1·5	0·7	sp. s.
Iodide	1	0·5	m. s.
Baryta, Nitrate	8	3	
Cadmium, Bromide	v. s.	v. s.	m. s.
Iodide	v. s.	v. s.	v. s.
Copper, Acetate	15	5	sp. s.
Sulphate	2·6	0·5	ins.
Gold, Chloride	v. s.	v. s.	v. s.
Gold and Sodium Chloride	v. s.	v. s.	m. s.
Iron, Perchloride	v. s.	v. s.	v. s.
Protosulphate	1·8	0·3	ins.
and Ammonia sulphate	3	0·8	ins.
Iodide (Ferrous)	v. s.	v. s.	sp. s.
Iodine	7000		m. s.
Kaolin	ins.	ins.	ins.
Lead, Acetate	1·8	0·5	m. s.
Chloride	v. sp.	33	ins.
Nitrate	2	0·8	ins.
Lithium, Bromide	v. s.	v. s.	m. s.
Iodide	v. s.	v. s.	m. s.
Magnesia, Nitrate	v. s.	v. s.	m. s.
Mercury, Bichloride	16	2	v. s.
Cyanide	12·8	3	ins.
Potassium, Acetate	0·4	v. s.	v. s.
One part is soluble in	Parts.	Parts.	
Potassium, Bicarbonate	3·2	dec.	ins.
Bichromate	10	1·5	ins.
Bromide	1·6	1	sp. s.
Carbonate	1	0·7	ins.
Cyanide	2	1	m. s.
Ferricyanide	3·8	2	ins.
Ferrocyanide	4	2	ins.
Nitrate	4	0·4	ins.
Iodide	0·8	0·5	m. s.
Oxalate	3	v. s.	ins.
Permanganate	20	3	ins.
Sulphate	9	4	ins.
Sulphite	4	5	sp. s.
Sulphuret	2	1	sp. s.
Silver, Nitrate	0·8	0·4	m. s.
Oxide	v. sp. s.	v. sp. s.	ins.
Sodium, Acetate	3	1	m. s.
Bromide	1·2	0·5	m. s.
Bicarbonate	12	dec.	ins.
Carbonate	1·6	0·25	ins.
Citrate	v. s.	v. s.	sp. s.
Hyposulphite	1	v. s.	ins.
Iodide	0·6	0·3	m. s.
Nitrate	1·3	0·6	sp. s.
Phosphate	6	2	ins.
Pyrophosphate	12	1·1	ins.
Sulphite	4	0·9	sp. s.
Sulphate	2·8	0·4	ins.
Tungstate	4·0	2·0	ins.
Strontia, Chloride	1·88	v. s.	sp. s.
Uranium, Nitrate	v. s.	v. s.	m. s.
Zinc, Iodide	v. s.	v. s.	m. s.
Bromide	v. s.	v. s.	m. s.
Chloride	0·33	v. s.	v. s.

WEIGHTS AND MEASURES, AND THERMOMETER TABLE.

WEIGHTS AND MEASURES.

480·0 grains Troy = 1 oz. Troy.
437·5 grains Troy = 1 oz. Avoirdupois.
5760·0 grains Troy = 1 lb. Troy.
7000·0 grains Troy = 1 lb. Avoirdupois.

MEASURES OF LENGTH.

Millimetre = 0·03937 inch.
Centimetre = 0·39371 inch.
Decimetre = 3·93708 inch.
Metre = 39·37079 inch.

Inch = 2·5399 centimetres.
Foot = 3·0479 decimetres.

MEASURES OF SURFACE.

Square inch = 6·4513 square centimetres.
Square foot = 9·2899 square decimetres.

MEASURES OF CAPACITY.

Cubic centimetre = 0·0610 cubic inch.
Ditto, ditto = ·00176 pint.
Litre, or cubic decimetre } = 61·0270 cubic inch, or 1·760 pint.

Cubic inch = 16·3861 cubic centimetres.
Gallon = 4·5434 litres.

MEASURES OF WEIGHT.

Milligramme = 0·0154 grains.
Centigramme = 0·1543 grains.
Decigram = 1·5432 grains.
Gramme = 15·4323 grains.
Kilogramme = 15432·3488 grains.

Grain = 0·0647 grammes.
Troy oz. = 31·1034 grammes.

THERMOMETER TABLE.

Comparison of Centigrade and Fahrenheit.

Cent.	Fah.	Cent.	Fah.	Cent.	Fah.	Cent.	Fah.	Cent.	Fah.
−17.7	0	7	44·6	31	87·8	55	131	78	172·4
−16	3·2	8	46·4	32	89·6	56	132·8	79	174·2
−15	5	9	48·2	33	91·4	57	134·6	80	176
−14	6·8	10	50	34	93·2	58	136·4	81	177·8
−13	8·6	11	51·8	35	95	59	138·2	82	179·6
−12	10·4	12	53·6	36	96·8	60	140	83	181·4
−11	12·2	13	55·4	37	98·6	61	141·8	84	183·2
−10	14	14	57·2	38	100·4	62	143·6	85	185
− 9	15·8	15	59	39	102·2	63	145·4	86	186·8
− 8	17·6	16	60·8	40	104	64	147·2	87	188·6
− 7	19·4	17	62·6	41	105·8	65	149	88	190·4
− 6	21·2	18	64·4	42	107·6	66	150·8	89	192·2
− 5	23	19	66·2	43	109·4	67	152·6	90	194
− 4	24·8	20	68	44	111·2	68	154·4	91	195·8
− 3	26·6	21	69·8	45	113	69	156·2	92	197·6
− 2	28·4	22	71·6	46	114·8	70	158	93	199·4
− 1	30·2	23	73·4	47	116·6	71	159·8	94	201·2
0	32	24	75·2	48	118·4	72	161·6	95	203
1	33·8	25	77	49	120·2	73	163·4	96	204·8
2	35·6	26	78·8	50	122	74	165·2	97	206·6
3	37·4	27	80·6	51	123·8	75	167	98	208·4
4	39·2	28	82·4	52	125·6	76	168·8	99	210·2
5	41	29	84·2	53	127·4	77	170·6	100	212
6	42·8	30	86	54	129·2				

SYMBOLS AND ATOMIC WEIGHTS OF THE ELEMENTS.*

Element.	Symbol.	Atomic Weight.	Observer.
Aluminium	Al	27·26	Berzelius
Antimony	Sb	122·3	Kessler; Dexter
Arsenic	As	77·15	Kessler
Barium	Ba	137·16	Marignac
Bismuth	Bi	210·0	Dumas
Boron	Bo	11·04	Berzelius
Bromine	Br	79·95	Stas
Cadmium	Cd	112·04	Lenssen
Cæsium	Cs	133·00	Johnson and Allen; Bunse
Calcium	Ca	40·00	Erdmann and Marchand
Carbon	C	12·00	Dumas and Stas; Liebig
Cerium	Ce	92·16	Rammelsberg; 91·34, Wolf
Chlorine	Cl	35·46	Stas
Chromium	Cr	52·08	Siewert
Cobalt	Co	58·74	Russell
Copper	Cu	63·12	Millon and Commaille
Didymium	D	94·96	Hermann
Erbium	E	112·6	Bahr and Bunsen
Fluorine	F	18·96	Luca; Louyet
Glucinum	Gl	9·30	Awdejew; Klatzo
Gold	Au	196·71	Berzelius
Hydrogen	H	1	Dulong and Berzelius
Indium	In	113·4	Winkler; Bunsen
Iodine	I	126·85	Stas
Iridium	Ir	196·87	Berzelius
Iron	Fe	56·00	Dumas
Lanthanum	La	92·88	Hermann; 90·18 *Zschiesch*
Lead	Pb	206·92	Stas
Lithium	Li	7·02	Stas
Magnesium	Mg	24·00	Dumas
Manganese	Mn	54·04	Schneider
Mercury	Hg	200·00	Erdmann and Marchand
Molybdenum	Mo	96·00	Dumas; Debray
Nickel	Ni	58·74	Russell
Niobium	Nb	94·0	Marignac
Nitrogen	N	14·04	Stas
Osmium	Os	199·03	Berzelius
Oxygen	O	16·00	
Palladium	Pd	106·57	Berzelius
Phosphorus	P	31·00	Schrotter
Platinum	Pt	197·18	Andrews
Potassium	K	39·13	Stas
Rhodium	Rh	104·21	Berzelius
Rubidium	Rb	85·40	Bunsen; Piccard
Ruthenium	Ru	104·40	Berzelius
Selenium	Se	79·46	Dumas
Silver	Ag	107·93	Stas
Silicon	Si	28·10	Dumas
Sodium	Na	23·04	Stas
Strontium	Sr	87·54	Marignac
Sulphur	S	32·07	Stas
Tantalum	Ta	182·30	Marignac
Tellurium	Te	128·06	v. Hauer
Thallium	Tl	203·64	Crookes
Thorium	Th	115·72	Delafontaine
Tin	Sn	118·10	Dumas
Titanium	Ti	50·00	Pierre
Tungsten	W	184·00	Schnieder; Dumas; Roscoe
Uranium	U	118·80	Ebelmen
Vanadium	V	51·35	Roscoe
Yttrium	Y	61·70	Bahr and Bunsen
Zinc	Zn	65·16	Axel Erdmann
Zirconium	Zr	89·60	Marignac

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* From Thorpe's "Quantitative Analysis."

ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Vegetable Acids.	OXALIC ACID, including POTASSIUM OXALATE	1 drachm is the smallest fatal dose known.	Hot burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting, or magnesia suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	AMMONIA POTASH SODA	Vapour of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	MERCURIC CHLORIDE	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk In emergency, flour paste may be used.
	ACETATE OF LEAD	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	CYANIDE OF POTASSIUM	*a*. Taken internally, 3 grs. fatal.	Insensibility, slow gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy: cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	BICHROMATE OF POTASSIUM	*a*. Taken internally.	Irritant pain in stomach, and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	NITRATE OF SILVER		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	NITRIC ACID	2 drachms have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe, and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	HYDROCHLORIC ACID	½ ounce has caused death.		
	SULPHURIC ACID	1 drachm has been fatal.		
	ACETIC ACID, concentrated, has as powerful an effect as the mineral acids.			
	IODINE	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot, and starch given freely.
	ETHER	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	PYROGALLOL	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

RATES OF POSTAGE, ETC.

Inland Letters.—To all parts of the Kingdom, for prepaid letters: Not exceeding 1 ounce, 1d.; exceeding 1 ounce, but not exceeding 2 ounces, 1½d.; and ½d. additional for every 2 ounces. A letter posted unpaid is chargeable with double postage, and one posted insufficiently paid is chargeable with double the deficiency. No letter may be above 18in. long, 9in. wide, or 6in. deep, unless sent to or from a Government office. Inquiry for Missing Letters, &c., should be made at the Secretary's Office, New Buildings. The Returned Letter Office is in Telegraph Street, Moorgate Street. "Letters to be called for" can be obtained at the General Post Office, St. Martin's-le-Grand, and at the Charing Cross Post Office. No letters (except communications from the Savings Bank Department) are taken in "to be called for" at the other district or branch offices, and any so directed are sent to the Returned Letter Office.

Book Post.—The postage is ½d. for every 2 oz. or part thereof. A book-packet may be posted either without a cover or in a cover entirely open at both ends, so as to admit of the contents being easily withdrawn for examination, or it will be treated as a letter. For greater security of contents, however, it may be tied at the ends with string. No book-packet may be above 5 lbs. in weight, nor above 18in. in length, 9in. in width, or 6in. in depth, unless sent to or from one of the Government offices.

Registered Newspapers.—On each inland newspaper, posted singly or in a packet, the postage, when prepaid, is ½d.; but a packet containing two or more registered newspapers is not chargeable with a higher rate of postage than would be chargeable on a book packet of the same weight, viz., ½d. for every 2 oz. or part of that weight. A newspaper which has any letter or communication of the nature of a letter written in it or upon its cover is charged as an unpaid or insufficiently paid letter. Newspapers for abroad must be posted within eight days of publication, or book postage rates be paid.

Pattern and Sample Post.—Is restricted to bonâ-fide trade patterns or samples of merchandise. Goods sent for sale, or in execution of an order, or any articles sent by one private individual to another which are not actually patterns or samples, are not admissible, nor are those liable to Custom duties.

Money Orders are granted in the United Kingdom at the following rates:—For sums under 10s., 2d., 10s. and under £2, 3d. 1d. extra for every additional £1 up to £10.

Money Orders Payable Abroad.—Foreign orders are issued at the following rates: If payable in France, Switzerland, Belgium, Denmark, Germany, Holland, Italy, Egypt, Malta, Gibraltar, United States, Turkey, Cyprus, Valparaiso, Panama, and most of the British Possessions and Colonies:—On sums not exceeding £2, 9d.; £5, 1s. 6d.; £7, 2s. 3d.; £10, 3s.

Patents.—On application for provisional protection, £1; on filing complete specification, £3; or on filing complete specification with first application, £4. Before the end of four years from date of first application, a renewal fee of £50 must be paid, and before the end of the seventh year a fee of £100. The two fees last named may be paid by instalments.

Inland Telegrams.—The charge for telegrams throughout the United Kingdom is 6d. for the first twelve words, and ½d. for every additional word. The names and addresses of sender and receiver are charged for.

Press Telegrams.—Information respecting press telegrams may be obtained on application to the Secretary, General Post Office, London, E.C.

Inland Parcels Post.—Parcels may be transmitted by the Inland Parcels Post under the following general conditions:—The rate of postage, to be prepaid in ordinary postage stamps, is, for an Inland Postal Parcel of a weight not exc. 1 lb., 3d. Each additional pound 1½d. Maximum weight, 11 lbs. The dimensions allowed on an Inland Postal Parcel are: Maximum length, 3 ft. 6 in.; maximum length and girth combined, 6 ft.

Foreign Parcels Post.—This system is under constant extension. The Posta Guide and the occasional notices should be consulted.

Registration.—The fee is 2d. in addition to the postage on a letter, book package, or newspaper package.

Post Cards, bearing a halfpenny impressed stamp, available for transmission between places in the United kingdom only, in packets of twelve for 7d. and 8d. Foreign Post Cards, with an impressed stamp of 1d. and 1½d. each, are sold at that rate, and are transmissible to the majority of the countries of the Union.

Postal Orders, providing a cheap and easy way of sending small sums of money to any part of the kingdom, can be purchased at the following prices:—For orders of 1s. and 1s. 6d. a commission of ½d. is charged; 2s. 6d., 5s., and 7s. 6d., 1d.; 12s. 6d., 15s., 17s. 6d., and £1, 2d. The sender can order these to be cashed at any post office, but they must be presented for payment within three months of their issue.

CONTENTS.

PAGE
Actinometer and Electrical Balance ... 48
Alkaline Gold-Toning 97
Ammonia Poisoning 56
Annals of Photography for 1886 28-30
Area System of Marking Lenses ... 107
Argentous Salts 108
Blue Process 194
Bottle, Varnish 57
Bromide Plates, Properties of 59
Calendar 4-15
Camera, Reflecting 183
Cameras, Small 119
Camera, Telescopic 182
Carbonate Developer, Platt's 85
Carbon Printing Process... 193
Centrifugal Apparatus for Laboratories 161
Chloride Emulsion Paper 74
Chloride of Gold 79
Chronological Notes 3
Collodion Process 169
Collotype for Amateurs 180
Colouring Photographs Against Glass 166
Convention, Work for Photographic ... 55
Copied, Lighting Surfaces to be ... 126
Criticism 41
Crystoleum Process 166
Cutting Glass Plate, Arrangements for 174
Cutting Sensitized Paper... 41
Cyanotype Printing 194
Daguerreotype Process 178
Dark-Room Lantern, New 89
Determining Speed of Rapid Shutters... 120
Developer, Platt's Carbonate 85
Developers 99
Developing Dish for the Traveller ... 65
Developing Lamp 80
Development of Paper Negatives ... 115
Double Oxalate of Potassium and Iron 93
Eclipses in 1887 3
Electrical Balance, Actinometer and .. 48
Electric Light in the Dark-Room ... 32
Emulsion, Highly Sensitive Gelatine... 176
Emulsion, Measuring Pourer for ... 172
Engravers, Printing on Wood for ... 106
Engraving, Phototypic 187
Enlargements on Bromide Paper ... 72
Enlarging 162
Everyday Experiences 161
Exhibition, Lessons from the Photographic 117
Exposure, Judging 31
Exposures 35
Exposure *versus* Development 34
Festivals, &c. 3
Finishing Silver Prints 58
Fog, Local 81
Formulæ, Standard 195
Gelatine Negatives, Intensification of... 37
Gelatine Negatives, Printing Qualities 112
Gelatine Plates, Non-Exposed 82
Gelatino-Bromide Paper Positives on... 105
Gold, Chloride of 79
Gold in Toning, Supply of 97

PAGE
Hints to Young Hands 51
Hypo Bath for Under-exposed Negatives 36
Intensification by Photography... ... 86
Inch, The Optician's 125
Instantaneous Exposure, Measure of ... 131
Instantaneous Shutters 133
Intensification of Gelatine Negatives ... 37
Intensifying, Local Protection before... 60
Iron Printing Process 194
Jottings 140
Kit, A Photographer's 68
Lamp, Developing... 80
Lantern Lecturers, Hints to 75
Lantern, New Dark-Room 89
Lantern Slide Carrier 100
Lantern Slides on Gelatino-Chloride ... 43
Lantern Stereoscope 170
Law Sittings 3
Lenses, Area System of Making ... 107
Lenses for Portraiture 44
Lessons from the Photographic Exhibition 117
Light in Dark-Rooms 126
Lighting Surfaces to be Copied... ... 72
Lime Light Apparatus 110
Making the Best of a Bad Day 95
Measuring Pourer for Emulsion ... 172
Memoranda, Standard Formulæ and ... 195
Morning and Evening Stars ... 4-15
Mounting Photographs 161
Naming Pictures 41
Non-exposed Gelatine Plates 82
Optician's Inch, The 125
Orthochromatic and Isochromatic *v.* Bromide Plates 62
Orthocoromatic Method for Copying ... 194
Orthochromatic Plates, Preparation and Use of 30
Paintings, Orthochromatic Method for Copying 194
Paper, Chloride Emulsion 74
Paper, Cutting Sensitized 41
Paper Negatives, Development of ... 115
Paper, Willesden 58
Photo-Engraving 58, 174
Photometer, Taylor's 82
Phototypic Engraving 187
Platt's Carbonate Developer 85
Poisoning, Ammonia 56
Poisons and Antidotes 213
Portraiture, Lenses for 44
Positives on Gelatino-Bromide Paper.. 105
Postage, &c., Rates of 214
Potassium and Iron, Double Oxalate of 93
Printing on Wood for Engravers ... 106
Print-washing Machine 103
Printing Qualities of Gelatine Negatives 112
Processes 161
Professional Beauty, The... 69
Reducing Density of Negatives... ... 179
Registering Frame for Printing on Wood-Blocks, &c. 177

PAGE
Reflecting Camera 183
Roller-Slide 102
Removing Varnish from Negatives ... 192
Residues 61
Retouchers, A Hint to 84
Retouching 42
Retouching, Touching 32
Seasons, The 3
Self-Help 114
Sensitive Gelatine Emulsion 176
Silver Printing on Albumenized Paper 179
Silver Prints, Finishing 58
Sitting-Room Photography 171
Slide Carrier, Lantern 100
Short Arrows 116
Slow Emulsions for Paper and Glass Positives 38
Shutter 110
Shutter, Cheap and Efficient 49
Shutters, Instantaneous... 133
Shutters, Quick-Acting 52
Shutters, Speed of 120
Small Cameras 119
Snow Effects in Portraiture 175
Speed in Emulsion 61
Stains on Gelatine Negatives 48
Standard Formulæ and Memoranda ... 195
Stand, Cheap and Serviceable 54
Stannotype for Transparencies... ... 67
Statuary Portraits... 73
Stereoscope, Stroh's Lantern 170

PAGE
Stops, Arrangement for Cap and ... 37
Storing Negatives 40
Stray Notes 77
Societies and Institutions, Scientific 24-26
Societies, Photographic 16-24
Support for Negative Paper 168
Symbols and Atomic Weights 212
System, or no System 104
Table of Poisons and Antidotes... ... 213
Table of Solubility of Photographic Chemicals... 210
Table, Thermometer 211
Tables for Conversion of Grammes, &c., into Ounces, &c.... 209
Taylor's Photometer 82
Telescope Camera 182
Things in General... ... ... 63, 109
Toning, Alkaline Gold 97
Toning, Supply of Gold in 97
Tourist Amateurs, Hints to 88
Under-Exposed Negatives, Preliminary Hypo Bath for 36
Varnish Bottle 57
Varnish from Negatives, Removing ... 192
View-Meter, Simple 50
Washing Negatives, Arrangement for 175
Weights and Measures 211
Willesden Paper 58
Wood, Photographing on... 173
Wood, Printing on... 106
Work for the Photographic Convention 55

CONTRIBUTORS.

PAGE
Abney, Captain, F.R.S. 31
Adcock, W. 41
Anon, Junr. 37
Ashman, W. M. ... 38
Archer, T. 55
Assam 133
Assam 109
Barnes, C. 42
Beach, F. C. 89
Blanchard, V.... ... 97
Borland, A. 107
Bothamley, C. H. 57, 61
Bottone, S. 32
Bowman, A. 84
Bridge, F. A. 102
Brooks, W. 68
Burton, C. I. 108
Burton, W. K.... ... 44
C. C. C.... 43
Cembrano, F. P. ... 51
Chesterman, C. T. ... 125
Clifton, E. 81
Cobb, F. 35
Cocking, E. 117
Cotesworth, W. 60
Cowan, A. 104

PAGE
Davies, R. 88
Debenham, W. E. ... 126
Drake, J. V. 48
Dresser, A. R.... ... 63
Drysdale, J. 54
Durnford, Major C. D. 85
Eder, Dr. J. M. ... 30
Elsden, J. V., B.Sc. 72
Emerson, P. H. ... 56
England, W. 103
Evans, A. F. 93
Gulliver, T. 82
Haakman, H. J. E. ... 112
Harrison, W J. ... 40
Henderson, A. L. ... 61
Hepworth, T. C. ... 100
Hollick, A. 37
Hollis, H. W. 49
Jervis, J. C. 65
Jones, B. 58
Jones, C. 34
Keene, R. 95
Knudsen, P. 114
Lang, W. junr. ... 67
Lawrie, A. P. 79

PAGE
Macdona, E. M. C. ... 41
Macdona, Rev. A. M. 74, 80
Marshall, J. W. ... 131
Matthews, W.... ... 86
Offord, R 73
Parr, R.... 52
Pearce, C. E. 69
Pim, G. 116
Plener, J. 48
Pringle, A. 75
Pumphrey, A.... 59, 72
Smith, G. ... 99, 107
Spiller, A. 115
Spiller, J. 97
Sturmey, H. 58
Sutton, S. H. E. ... 77
Taylor, F. B. 50
Wall, A. H. 32
Watts, W. A. 120
Werge, J. 62
Williams, G. F. ... 119
Wilkinson, W. T. ... 53
Woodbury, W. E. ... 36
Wood, H. T. 105
Zaehnsdorf, J. W. ... 110

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